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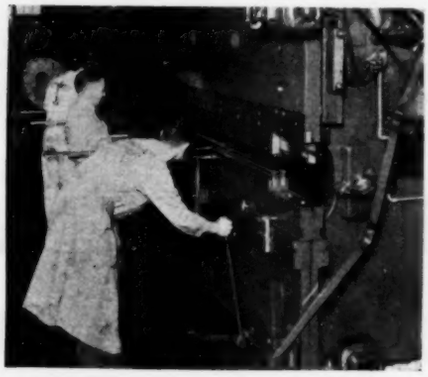

Kinked for Kiting—*Aluminum alloy airplane wing stiffeners are corrugated to give maximum strength with minimum weight (page 1028)*

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So HE THAT RUNS MAY READ!

—Cowper

• We're sure the poet didn't have YOU — the present-day production man — in mind when he wrote that line. He didn't anticipate our urge for speed that makes the men who run the plant do more running than any of their employees.

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OUT JAN. 24th

AMERICAN MACHINIST — For 62 YEARS "TOPS" in METAL-WORKING

ESTABLISHED 1877 **AMERICAN MACHINIST** BURNHAM FINNEY, Editor

Learning under actual shop conditions includes working under the tough foremen as well as the easy-going ones

Bill Smith, Jr., Learns His Trade

Kearney & Trecker carefully checks Bill's background and brains, and trains him in the shop proper under actual production conditions. The system doesn't need a huge plant to make it work

By R. R. WIESE
Western Editor, American Machinist

ONE MORNING we walked in on George Havlista, apprentice supervisor at Kearney & Trecker, just as he was finishing his daily stint of interviewing applicants for jobs. Since he acts both as apprentice supervisor and employment manager, Mr. Havlista has personal knowledge of the class of men being employed and knows what the apprentice of today must be to make the good journeyman of tomorrow.

He leaned back in his chair and said, "We try to do two things here. One, we choose our apprentices carefully because we feel it would be a social misdemeanor to waste four years of a boy's life and of the employer's time, only to produce a misfit. Two, we train our apprentices right in the shop where they learn under actual production conditions. They learn to work with the tough foremen as well as the easy-going ones.

"Boys are hired according to their ability as determined by brief written tests given at the time of their application. A method which we have found effective for checking their ability and powers of observation is to time them on a simple test involving the conversion of fractions of a circle into degrees, or vice versa.

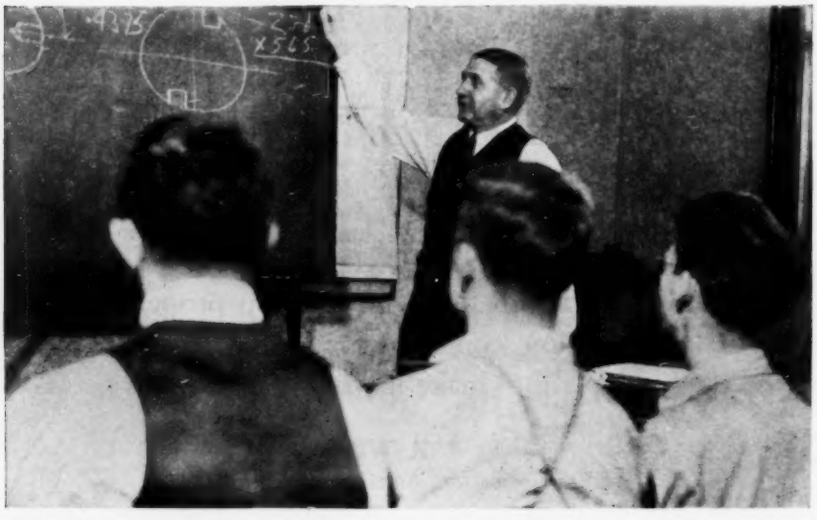
"Only high school graduates between the ages of 18 to 22 are eligible. Attendance at night school is required during the four-year course. To insure that four years of the boy's life are not wasted, every precaution is taken to hire only those who are mechanically inclined. Even then a probationary period of three months is used to weed out any unfitted ones. At the present time, this preliminary period is spent in the shop proper. The boys get their feet on the ground by starting in the inspection department, or on simple milling machine or lathe jobs, or drill press jobs where jigs are used.

"To show you how well our method of selection has worked out, and how well our simple preliminary tests weed out the undesirables, we have had only 16 men out of 139 cancel their contracts in the last four years. In that same time we have graduated 65 apprentices of which 64 are still employed with us."

Regular Indenture Forms Used

Mr. Havlista went on to tell us that upon selection the boys sign the regular indenture forms which have been established by the Industrial Commission of Wisconsin. The forms stipulate that the term of apprenticeship is 8,320 hours of employment based on 40 hours per week and 52 weeks per

In four months Kenneth Bakke will be handing out cigars as the apprentice flag flies from the Kearney & Trecker flagpole indicating that he has finished his four years' training. When this picture was taken Kenneth was already doing a first class journeyman's job with a new precision double-end boring machine on parts requiring high accuracy



Apprentices meet with the apprentice supervisor for one hour a week to discuss general problems not touched upon in shop or evening school training. They learn about the company from men in charge of various departments

year. The apprentice spends one day a week at the Milwaukee vocational school for a minimum total of 576 hours which is counted as part of the hours of labor.

The contract also states that the apprentice shall be given such instruction and experience in the machinist trade as will qualify him as a competent mechanic. His instruction includes: drill press, 175–525 hr.; milling machine, 1,040–2,080 hr.; screw machine, engine lathe, turret lathe and boring mill, 2,080–3,120 hr.; planer and grinder, 1,040–2,080 hr.; and assembling and erecting, 1,040–2,080 hr.

The contract further states that the wages for the first period of 1,040 hr. shall be 30¢ per hr., gradually increasing to 55¢ per hr. for the eighth period. Upon the satisfactory completion of this contract the apprentice receives a bonus of $100 together with a diploma and a journeyman's pin.

A special provision is included to the effect that, if at any time the existing level of wages of skilled workmen in the community has changed ten per cent or more, up or down, from the level which existed when the wage scale was last set, the Industrial Commission shall then adjust the wage scale in proportion to such change. It is further specified that the apprentice shall attend evening school at least one night a week throughout his apprenticeship.

The present number of apprentices at Kearney & Trecker is 97, with a shop employment of over 1,200. The recommended minimum standard for the company is 80 total apprentices. This includes 65 for the machine shop (broken down in the accompanying table), 2 for the engineering department, 1 for the electrical department and 6 university students.

The following procedure which takes place when Bill Smith, Jr., enters the lathe department is typical of training given in other departments.

Two or three days is required on tool grinding. Tool bits for practice grinding are of 4x$\frac{3}{8}$-in. square cold rolled steel. After the apprentice has mastered the grinding operation he is given tool steel bits to grind. He then goes to work on a small lathe where he does straight turning and facing operations. After four weeks he is transferred to another lathe where close tolerances are held and micrometers are used. Four weeks later he is assigned to a larger lathe where more difficult operations are performed. The next four weeks is devoted to larger work and also taper and thread cutting, boring and tapping.

Shifted at Four-Week Intervals

The fifth four-week period is intended to give Bill all-round training. His duties are to fill the place of one of the four other apprentices in his department, each being assigned a different school day. Since only four lathes are assigned to the group, no lost machine time is encountered by this arrangement. All other departments and changes are scheduled in the same manner, thereby giving apprentices regular changes at set intervals. During the sixth period of four weeks Bill acts as a utility man and is responsible for the quality of work and production of the other five apprentices in the lathe department. In case a regular employee is absent Bill fills that vacancy. As a utility apprentice Bill has an opportunity to show his junior executive ability.

The company has also established an apprentice "utility squad." Four apprentices are selected who are always available to help in emergencies and to fill vacancies in any department caused by absence of regular employees. In case there is an idle

machine or an important job and emergency help is needed, a foreman can request the services of one of the members of the squad. The foreman in charge of such an apprentice immediately releases him to the other department.

The maximum time of emergency squad service in any one department is limited to one week for each apprentice. Such an apprentice must be replaced by another, in the event the department does require additional help. This limitation is established so that all utility squad apprentices may benefit by this special training.

Regular Promotion Assured

Apprentices are promoted from one class of work to another according to a regular schedule planned in advance, the time in each class of work varying with the duties which have to be performed. Each apprentice is under direct charge of the foreman for whom he works. The apprentice supervisor deals directly with the foreman when incorrect training methods are used. This plan eliminates friction and sells the foremen on apprenticeship, which is one of the most important factors of a successful program.

Apprentice meetings of one hour are held weekly to discuss such subjects as time studies, cycle work, management of departments, sales and advertising, mathematics, trigonometry, slide rule, and shop theory. Shop trips are made through the various departments with the foremen in charge acting as guides. Lectures are given by members of the sales and cost departments, by pattern-making foremen, road salesmen, and others. Technical literature is furnished.

Machine shop arithmetic problems are extra homework for the boys. This is non-compulsory, but it has been found that nearly all the boys are ambitious enough to do this extra work. Night school attendance, which ranges from one to four nights a week, is also required of all apprentices, without pay. However, credit is given on the indenture time for the hours of night school attended. Weekly reports and sketches of work and the jobs handled are required of each apprentice.

At the completion of the indentured time, Bill Smith, Jr., goes to the foremen in the various departments in which he has worked and asks for a regular job. When he is accepted by a foreman, it is almost certain that he did a good job in that department and is placed in the plant for the best use of his service.

Upon completion of his contract, each apprentice receives a $100 bonus with his diploma and journeyman's pin

RECOMMENDED MINIMUM MACHINE SHOP APPRENTICES FOR SHOP EMPLOYING 1,200 MEN

Department	*Machines*	*Apprentices*
Lathe	4	6
Turret Lathe	4	6
Planer	4	6
Gear Cutter	2	2
Milling Machine	4	6
Drill Press	2	4
External & Surface Grinder	3	4
Erecting	—	4
Inspection & Bench	—	4
Cutter Grinding, Thread Miller, Int. Grinder	4	5
Erecting	4	5

Department	*Machines*	*Apprentices*
Assembling Gear Run In	1	1
Tool Inspection Layout Floor	—	5
Inspection	—	2
Experimental Room, Lathe	1	1
Experimental Room, Milling Machine	1	1
Dividing Head Bench	—	1
Lo Swing	1	1
Saws	4	5
Screw Machine	—	—
Turret Lathe	—	—
	—	—
TOTAL	35	65

APPRENTICES SHARE IN K.&T. BONUS PLAN

SINCE HE BEGINS his apprenticeship on the "firing line," Bill Smith, Jr., has a chance to add to his stipulated wages by doing his assigned work in less than the allotted time.

The system of payment for Kearney & Trecker shop employees can be explained by the following example: The time required to mill a lot of 100 pieces has been set at four hours. If the machine operator (apprentice or journeyman) does the job in three hours he makes a bonus equal to half of the time saved, in this case one-half an hour's pay.

To make the method of payment equitable for all men involved, the assistant foremen, utility apprentices and even the crane operators receive a bonus based on the over-all percentage of savings which are made in their department.

Not only does this add incentive to the regular job but it insures that every apprentice is carefully watched and trained to hold up his end. Spoilage is deducted from the bonus payments on the same basis to prevent rushing through a job without regard to quality.

Wings of metal

American Airlines Photo

When military and commercial planes shed their fabric and grew sturdier wings of metal the first step was taken toward quantity production of aircraft

By JACK LA RUE

SAFETY AND RELIABILITY are the factors which affect every step in aircraft building. Accuracy of component parts is vital. This is especially true in the fabrication of the aluminum alloys used in the wings and fuselage. Shearing and forming of these thin materials require equipment of machine tool precision that can deliver a higher degree of accuracy than ordinarily demanded in other fields.

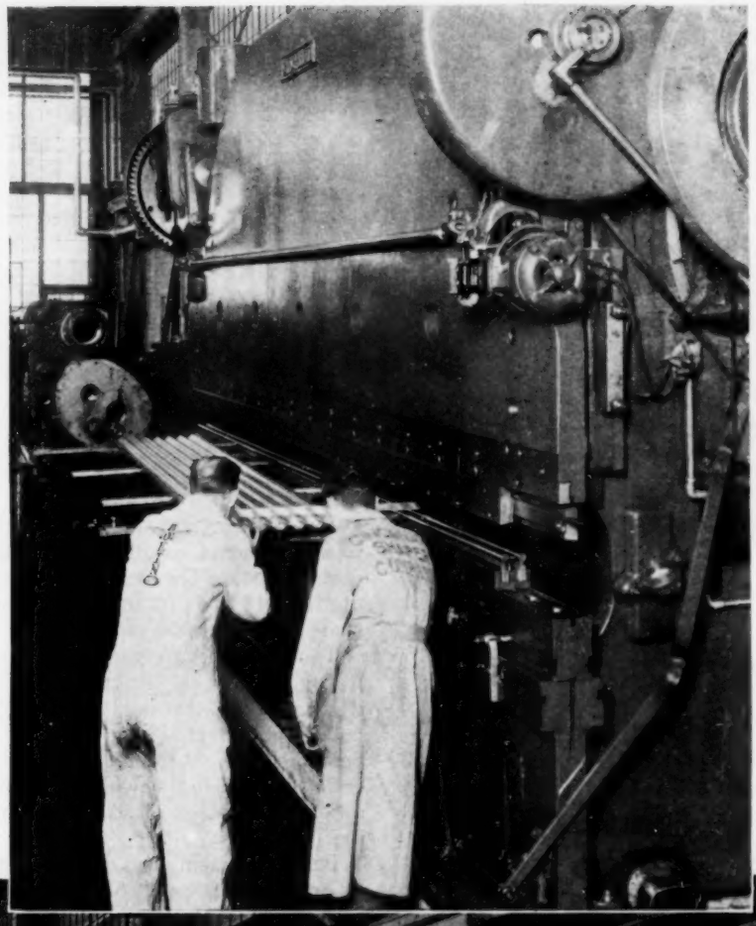
Power shears are used for cutting and slitting the metal skin for fuselage and wing outer surfaces and also for shearing heavier aluminum alloys including the sheets for the corrugated wing stiffeners. The shear must cut to unusually close tolerances and handle long sections of stock as thin as 0.005 in. for which knife clearances must be held to 0.001 in. These exacting mechanical requirements are met successfully by shears of all steel construction, with such refinements as hydraulic hold-downs and power-operated gages. Shears of this type are in use by practically all leading aircraft manufacturers in the United States and abroad.

Because the press brake is the only machine that can corrugate large metal sheets on a practical production basis, the builders of military and transport planes use press brakes for forming fuselage and corrugated wing stiffeners. The press brake has been developed amazingly during the past twenty years. It may be considered an unusually accurate and powerful mechanical press with an elongated die surface. Press brakes are used in a wide variety of industries for bending, forming and multiple punching of sheet metal. When airplane manufacturing reached the mass production stage, the aircraft industry found the press brake a tried and proved tool ready to answer a vital need in a new field.

The problem in corrugating aircraft aluminum alloys arises because different thicknesses of unusually long sheets are used with different pitches and accordingly give a variety of combinations theoretically requiring a die for each. However, this problem has been solved in many cases by combining the developments in press brake adjustment with special die construction which permits practical production with but one or two adjustable dies. The general practice is to have the pitch of the corrugation twice its depth. This gives a maximum stiffness because of the continuous curvature of loops that are true semi-circles.

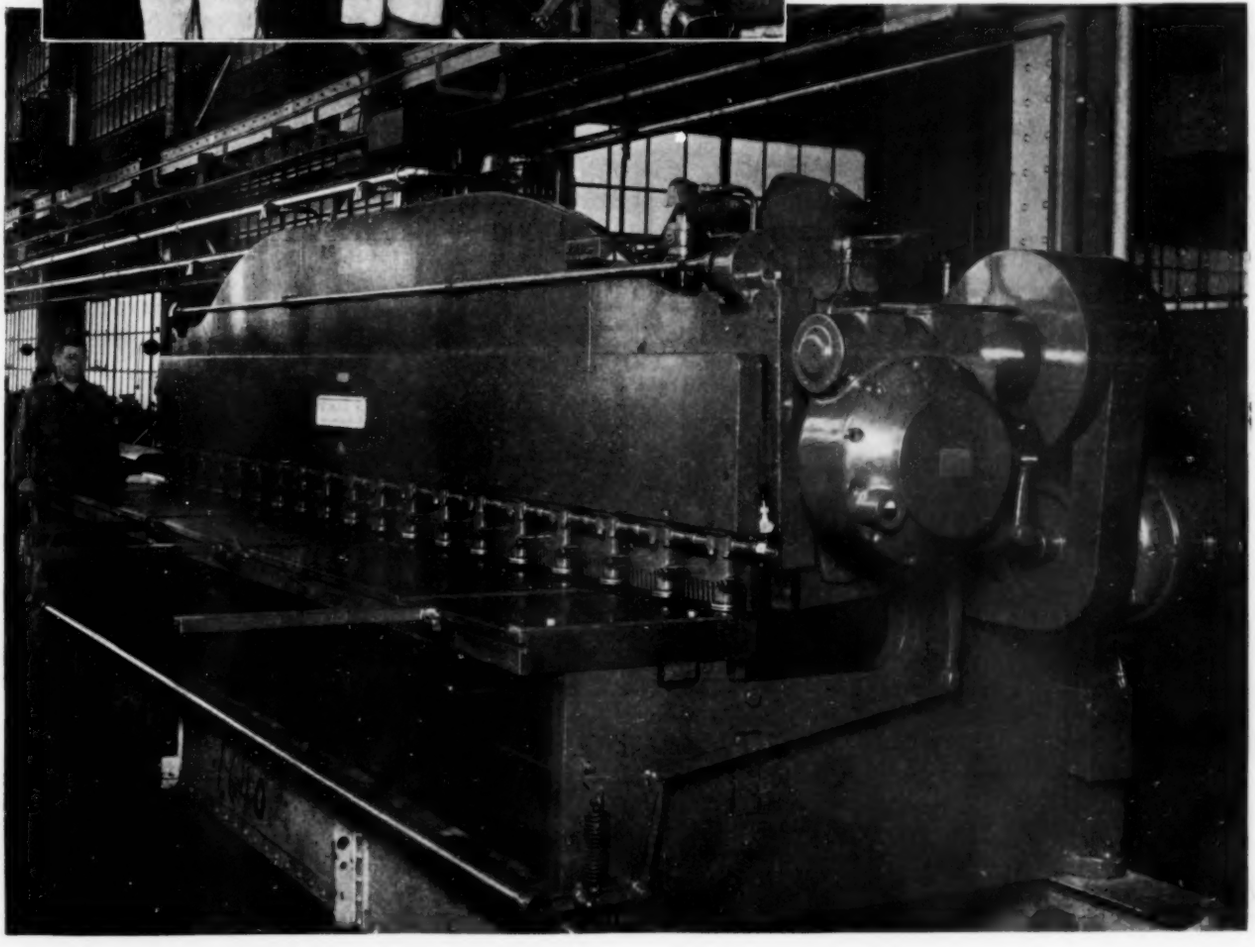
The steel press brake is also used for many other bending and forming operations in aircraft manufacturing including channel sections, cap strips and wing tip sections. Rubber blanket forming on press brakes is a rapidly advancing development in aircraft sheet-metal working.

From the standpoint of national defense, manufacturing facilities to produce airplanes in quantity is, in the long run, more important than the size of the air force on any given day. Constant engineering research brings changes in design which may render obsolete almost overnight the major portion of the available military airplanes. Even the experts cannot agree on the mortality rate of planes in active service; some say replacement would be as low as 30 per cent a month, others say this figure should be revised sharply upward to as high as 65 per cent. But one point stands clear—effective air defense depends ultimately on manufacturing abilities and capacities.



Standard die setting is established for each thickness of material used. Once the desired pitch of corrugation is obtained, the press brake delivers uniformly corrugated sheets in a succession of strokes. Higher speeds are possible on certain thicknesses of material so press brakes for aircraft are usually equipped with a two-speed mechanism. The men here shown have just checked a completely corrugated aluminum sheet

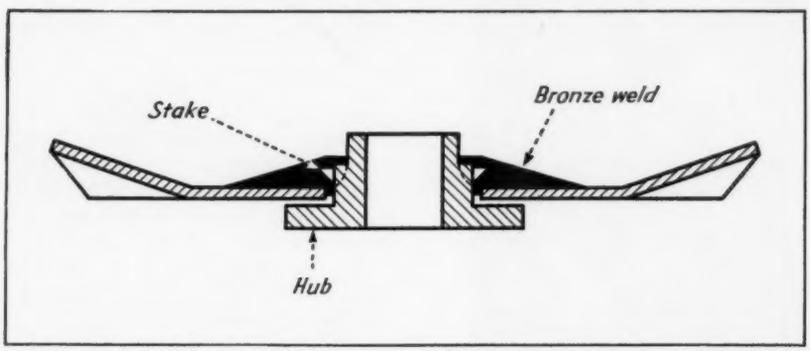
Shearing to closer tolerances is the first step in fabricating aluminum alloy sheets for aircraft building. These sheets range in thickness from 0.005 in. for the outer metal skin to 0.062 in., or heavier, for wing and structural parts. The problem of shearing 12- to 18-ft. lengths of this material requires a knife clearance as close as 0.001 in. This Cincinnati all-steel shear is one of several built for aircraft manufacturers



Flaming the Fans

Fans for portable tools are assembled securely and economically by an automatic bronze welding process. Stress relieving is an incidental advantage

By JAMES E. TAYLOR
Welding Foreman, Black & Decker Mfg. Company



Fans were formerly assembled by staking only, but bronze welding was added to obtain a more dependable joint. For 3⅛-in. diameter fans the fillet weld is 0.040 to 0.050 in. in thickness

Photographs Courtesy of the Linde Air Products Company

Placing the work in the machine is the only manual operation. Note the wire reel at the operator's left and the tote pan for catching the completed parts

SMALL SHEET METAL FANS cool the motors used in Black & Decker portable tools. The fan blades, ranging from 1⅝ to 5⅞ in. in diameter, are made from 16- to 20-gage metal.

The fan blades are stamped out and staked on the hub. At one time this staking was all that held the fan and hub together. However, to insure a permanently tight joint a brazing operation was added which had the additional advantage of stress-relieving the blades.

Formerly brazing was done by hand at an average speed of about one blade per minute. Recently, however, a machine has been devised to bronze weld the blade to the hub automatically. The machine turns out an average of ten to twelve assemblies per minute.

Additional advantages, other than speed, are that the joint is more uniform, sounder and stronger, and that only about half the amount of welding rod is required. The rod is more uniformly deposited, and there are no scrap ends.

How the Machine Is Made

The machine consists of a track about 8 ft. long, with a series of ten equally spaced positioner fingers. The fan blades and hubs are placed at one end of the track by hand, and from there on the operation is automatic. The parts are automatically preheated, welded and deposited in a pan at the opposite end of the track.

The fans may be placed on the track in any one of the four divisions at the right. Then, as a fan blade moves into successive positions, it passes over four preheat burners of city gas where it is brought to a temperature of 1,200 to 1,250 F. Finally, in the ninth position, it is oxy-acetylene welded.

When the blade reaches the ninth

position, a rotating stem automatically rises, engaging the fan hub. At the same time a blowpipe dips into position for the welding operation; welding rod is automatically fed at a predetermined rate from a reel.

The turning stem not only raises the fan into position, but also rotates it at a speed of 25 r.p.m. during the brazing operation. The welding blowpipe is brazed into a manifold or header so that the gases are distributed to four tips connected to the manifold by means of copper tubing.

The four tips are positioned so that they are equally spaced about the hub. The wire feeds in under one of the tips, melts and drops on the rotating fan, forming a shallow puddle of molten bronze. The tips are about $\frac{1}{8}$ in. from the work, and a slightly oxidizing flame is used which increases the speed of the operation.

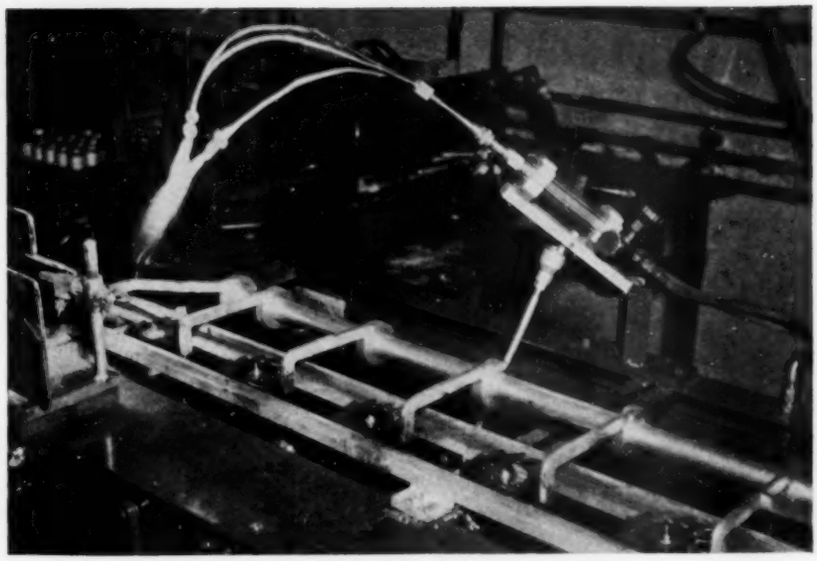
Wire Feed Mechanism

The bronze rod is automatically fed by a wire feeding mechanism run by an electric motor. The motor is controlled by a mercury switch in series with a rheostat. The bronze rod is $\frac{1}{16}$ in. in diameter, and can be fed at the rate of 1 to 6 in. of rod per fan, depending on the size being handled at the time.

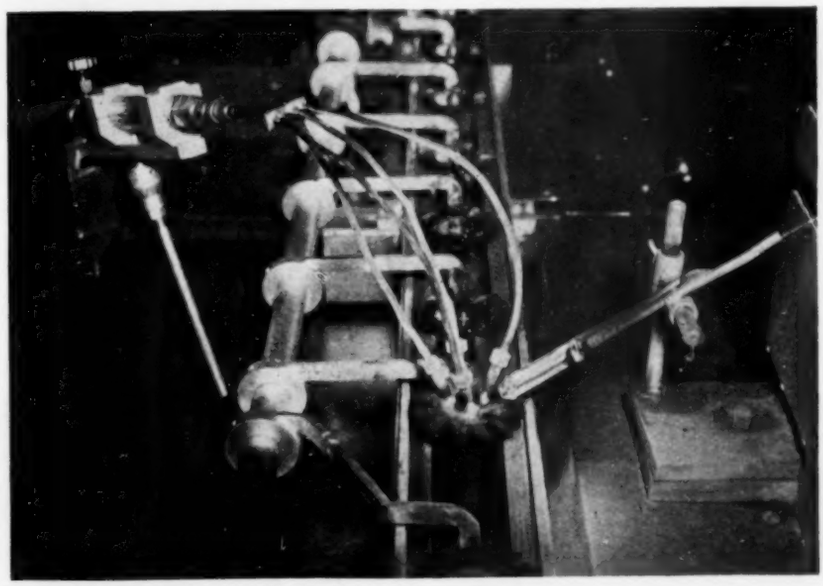
Oxygen and acetylene are supplied through pipe lines from manifolded cylinders, the acetylene passing through a vapor flux dispenser.

The entire mechanism is operated by a series of cams on a main shaft. The speed of the mechanism is adjustable through a double cone pulley. The position of the fingers is also adjustable, as is the width of the track to accommodate different sizes of fans.

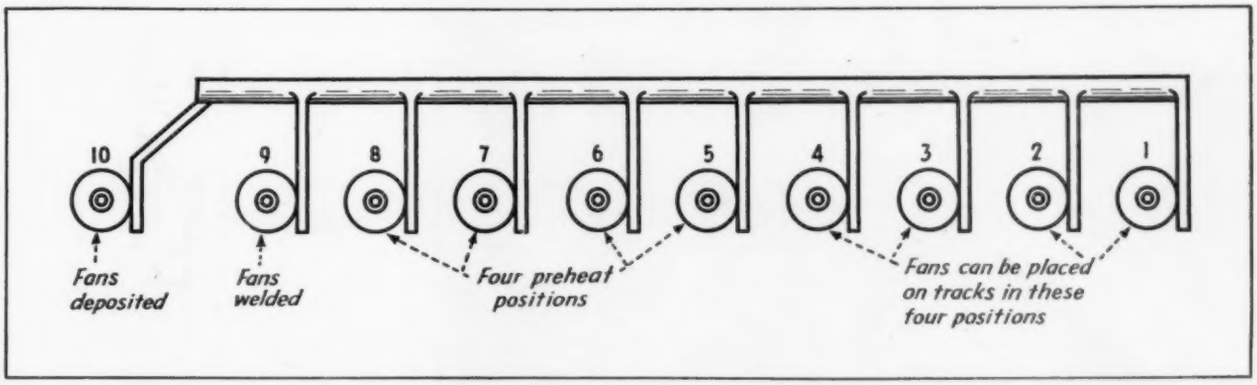
The automatic machine has been usesd for a variety of other applications, including the annealing of small circular saws.



At the welding station, the torch is lowered so its four tips are spaced equally around the blade. For the size of fan shown, wire feed is 2 in. per min.



During the movement of the work, the blowpipe is raised by means of a cam-operated mechanism. Wire feed is synchronized with the motion of the torch



Each of the positioner fingers is attached to a long rod. In operation, the rod moves to the left shoving the fans along to the next position. Then the fingers are raised, return to the original position and are lowered so the cycle can be repeated

Inside and Out

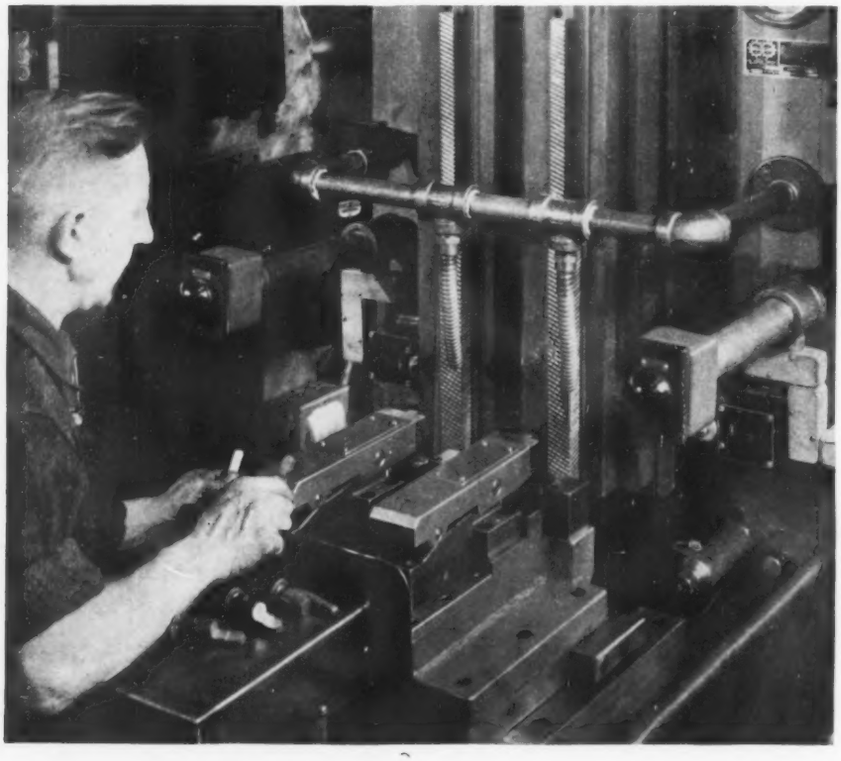
Both internal and external surfaces on rifle parts are broached without difficulty. These case studies show how

BROACHING got its start as a method of machining keyways and irregular internal contours. External operations were attempted but were uncommon until recent years. Then improved equipment and tool technique resulted in a sudden spurt of popularity for the process. Today outside surface broaching is used alongside internal operations with advanced tooling set-ups applied to both.

No longer is it necessary to make many set-ups and take light cuts on multiple irregular contours on rifle parts; broaching does the job quickly and accurately.

Studies made during the past year in one ordnance factory, where 26 standard vertical, internal and external broaching machines are installed, have shown how effective broaching is in the manufacture of many rifle parts. High-speed production of sight bases, triggers, trigger guards, automatic bolts, and many miscellaneous parts is an accomplished fact. Manufacturing details on some of these parts were published in earlier issues (AM— Vol. 8, pages 905 and 994); others are given here.

The machines on which the work is done are single-slide vertical surface, double-slide vertical surface and vertical pulldown Oilgear units equipped with tools and fixtures by the Detroit Broach Company. All internal surfaces are broached on vertical pulldown machines, while external surfaces are broached on single- and double-slide vertical surface machines. The pulldown type are equipped with automatic tool handling devices; dual push-button control with selector switch for manual, semi-cycle and semi-automatic operation; automatic puller operation; and variable broaching and return speeds. The vertical surface machines have a selector switch for manual, semi-automatic and full-automatic operation; automatic straight in-and-out shuttle-table operation interlocked with tool-slide operation; micrometer stops for precise positioning of the shuttle table and work in broaching position; automatic clamping and unclamping of work; and variable broaching and return speeds.



COCKING PIECE

MATERIAL: Forged carbon steel.

OPERATION: Finish broach four surfaces on two parts per stroke.

STOCK REMOVED: 0.120 in. on each surface.

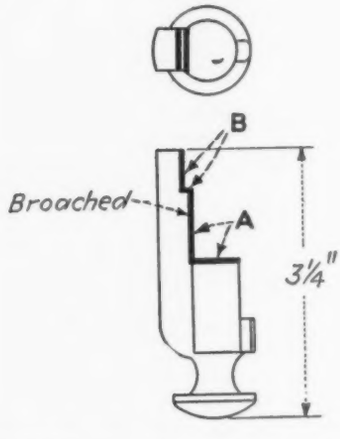
PRODUCTION: 500 pieces per hr.

TOOL: Special shear slab type with the lower sections arranged to broach surfaces *A* and the upper sections arranged to broach surfaces *B*.

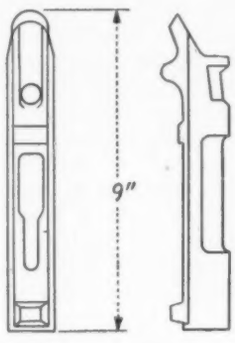
FIXTURE: Automatic jaw type with spring-loaded wedges for automatically clamping and unclamping the parts as the shuttle table moves to and from the broaching position.

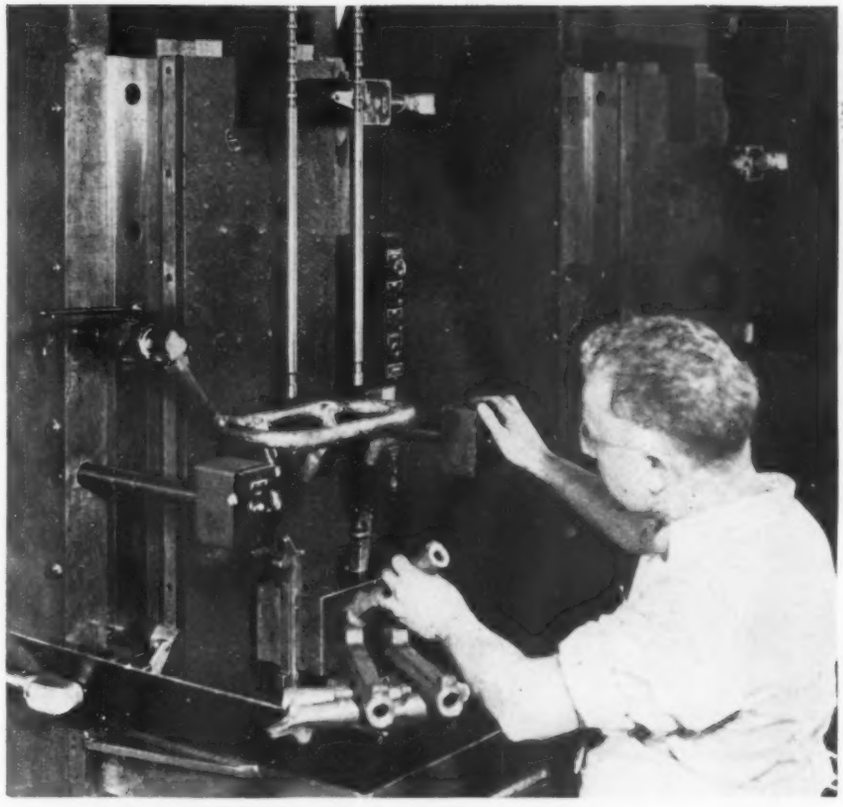
MACHINE: Single-slide vertical surface broaching machine, 30-in. stroke.

CYCLE: Operator places a rough part in each fixture and depresses the



dual safety control button. Shuttle table moves in to the broaching position and the jaws automatically clamp the parts in place. Tool-slide automatically moves down to broach the parts and stops momentarily as the shuttle table moves out to the unloading position, automatically unclamping the part. The tool-slide rises to starting position and stops as the operator removes the finished parts and installs two new rough parts. Cutting speed, 30 ft. per min. Return speed, 80 ft. per min.





RIFLE RECEIVER

FIRST OPERATION

MATERIAL: Forged carbon steel.

OPERATION: Finish broach a 0.662-in. diameter hole—the full length of the rifle receiver from a rough drilled hole. Broach two parts per stroke.

STOCK REMOVED: 0.007 in. per side or 0.014 in. on the diameter.

PRODUCTION: 350 parts per hr.

TOOL: Standard round-bar type with both ends arranged for automatic handling.

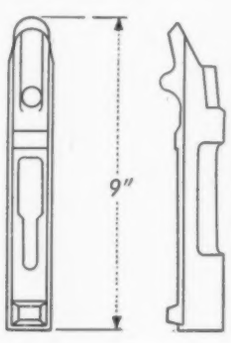
FIXTURE: Simple faceplate type for roughly locating parts.

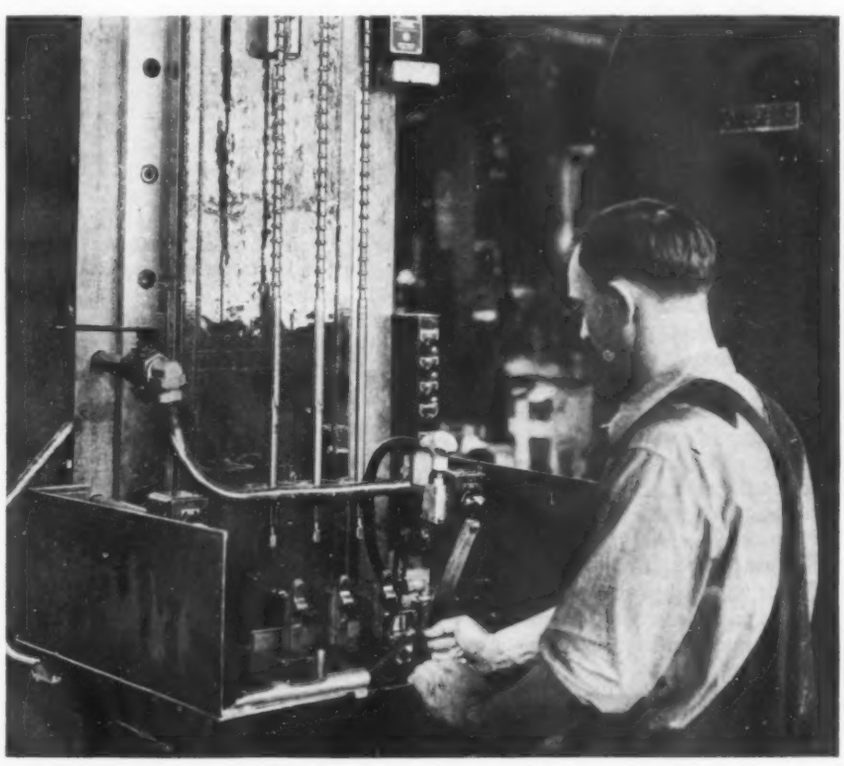
MACHINE: Vertical pulldown broaching machine, 30-in. stroke.

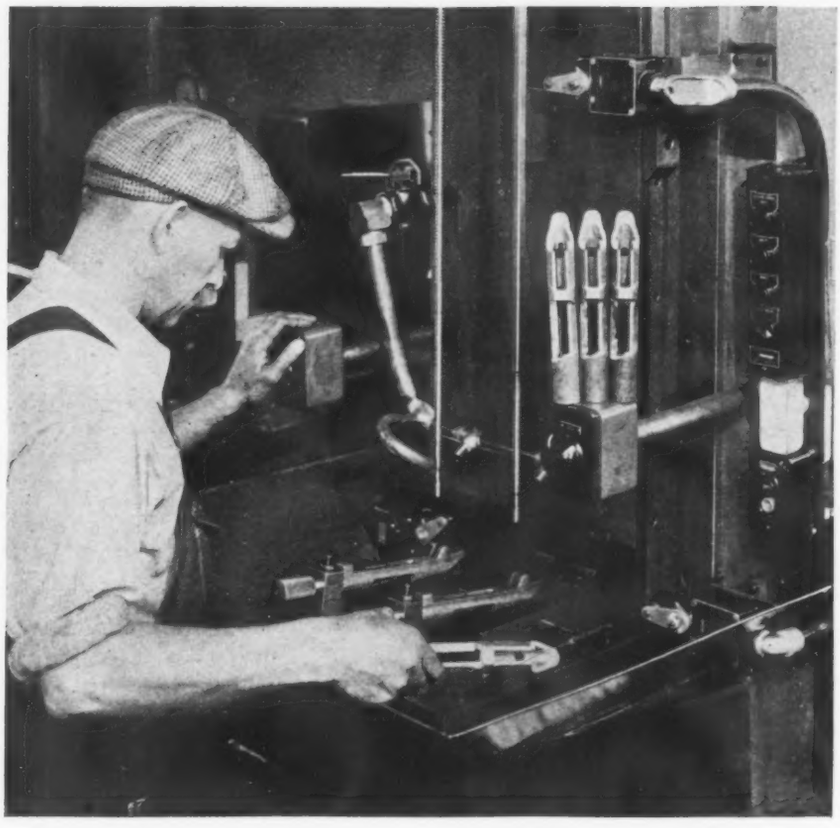
CYCLE: Operator roughly locates two parts in the fixture and depresses the dual safety control button. Tools thread through work, enter pullers and are automatically pulled down to broach the parts. Finished parts are removed and the dual safety control is depressed to return the tool-slide and tools to loading position. Operator does not have to handle the tools. Cutting speed, 30 ft. per min. Return speed, 80 ft. per min.

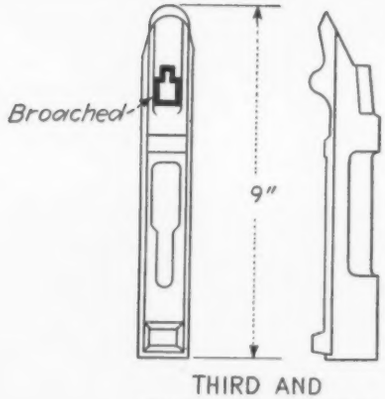
SECOND OPERATION

OPERATION: Finish broach two opposing slots $\frac{1}{2}$ in. wide by 0.162 in. deep in the full length of the rifle re-









THIRD AND FOURTH OPERATIONS

ceiver. Three draws are required to remove the metal so as to cut down the wall force and prevent the wall from breaking out on one side where it is considerably thinner than on the opposite side. The parts are moved in the fixture from the right to the left so that a finished part is available after each stroke of the machine.

STOCK REMOVED: 0.162 in. deep by $\frac{1}{2}$ in. wide.

PRODUCTION: 150 parts per hr.

TOOL: Special bar type with double tongues to broach the opposing slots and arranged on both ends for automatic handling.

FIXTURE: Simple holder for roughly locating the parts in position for the broaching operation.

MACHINE: Vertical pulldown broaching machine, arranged for semi-automatic operation, 54-in. stroke.

CYCLE: Operator roughly locates the three parts in the fixture and slides the fixture inward to the broaching position where a small arm contacts a fixture switch and starts the broaching cycle. Tools thread through the work, enter the pullers, and are automatically pulled down to broach the parts. At the end of the downward stroke, the cams on the tool-slide automatically move the shuttle fixture outward to the unloading position where the finished part is removed and the other two parts are moved to the left and a new rough part is put in position as the vertical tool-slide and the three broaching tools are returned to the starting position. Operator does not have to handle the tools nor depress the push buttons to start or stop the machine. Cutting speed, 30 ft. per min. Return speed, 80 ft. per min.

THIRD AND FOURTH OPERATIONS

THIRD OPERATION: Finish broach a 0.443 in. by 0.462 in. rectangular hole from a $\frac{7}{16}$ in. diameter drilled hole with the tool on the left-hand side.

STOCK REMOVED: 0.107 in. in the corner.

FOURTH OPERATION: Finish broach a keyway slot 0.220 in. wide by 0.279 in. deep in the same part with the tool on the right hand side.

STOCK REMOVED: 0.279 in.

PRODUCTION: 175 finished pieces per hr.

TOOLS: Special form and cutter-bar type with both ends arranged for automatic tool handling.

FIXTURES: Simple faceplate type with dual locating points for each receiver part.

MACHINE: Vertical pulldown broaching machine, 30-in. stroke.

CYCLE: Operator locates a rough part in the left-hand fixture and locates a part (previously broached with the left-hand tool) in the right-hand fixture; he then depresses the dual safety control buttons. Tools thread through the work, enter the pullers and are automatically pulled down to broach both parts. The finished parts are removed and the dual safety control is depressed to return the tool-slide and tools to loading position. Operator does not have to handle the broaching tools. Cutting speed, 30 ft. per min. Return speed, 80 ft. per min.

RIFLE SIGHT BASE

MATERIAL: Forged carbon steel.

OPERATION: Finish broach a special contour $\frac{3}{4}$ in. wide by 3 in. long on two parts per stroke. Maximum tolerance 0.002 in. in increments of $\frac{1}{16}$ in. on the contour.

STOCK REMOVED: 0.175 in. max.

PRODUCTION: 450 per hr.

TOOL: Combination shear, form, slab and generating insert type with the two lower sections finishing the portion *A* and rough finishing the balance of the part. The center sections finish broach the surfaces *B* and *C*, while the upper sections finish the groove *D*.

FIXTURE: Automatic dual-jaw with spring-loaded wedges for clamping and unclamping the parts as the shuttle table moves into the broaching position and out to the loading position. Before the parts are clamped in place they are automatically located in place as the shuttle table moves inward.

MACHINE: Single-slide vertical broaching machine, 42-in. stroke.

CYCLE: Operator roughly locates two parts in the fixture and depresses the dual safety control buttons. Shuttle table moves into the broaching position as the side guides locate accurately the rifle sight bases in position before the dual clamps grip the parts in place. Tool-slide automatically moves down to broach the parts

and stops momentarily as the shuttle table moves out to the loading position automatically opening the jaw clamps. As the parts are being removed from the fixture, the tool-slide rises to the starting position and stops. The cycle is semi-automatic. Cutting speed, 30 ft. per min. Return speed, 80 ft. per min.

RIFLE PART

MATERIAL: Forged carbon steel.

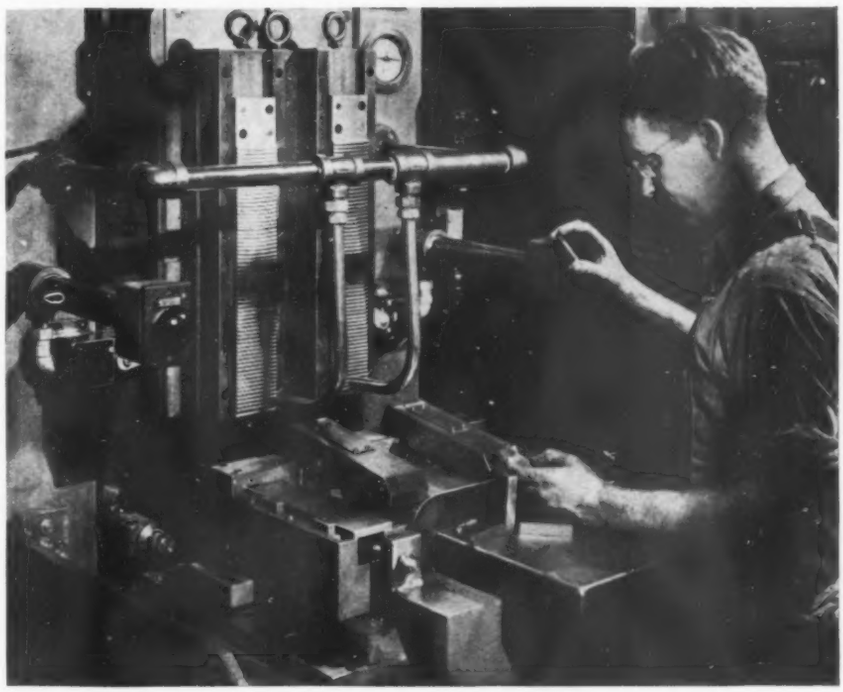
OPERATION: Finish broach a 21-in. radius on two rifle parts per stroke.

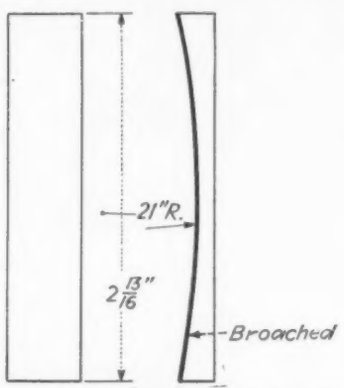
STOCK REMOVED: 0.060 in.

PRODUCTION: 460 pieces per hr.

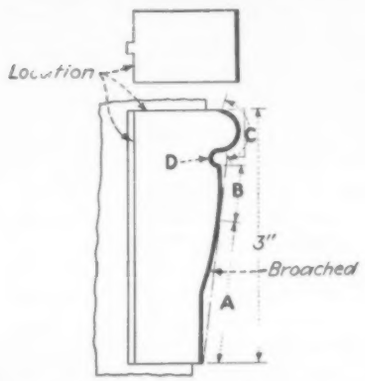
TOOL: Special slab type with a finished form to suit the large radius broach.

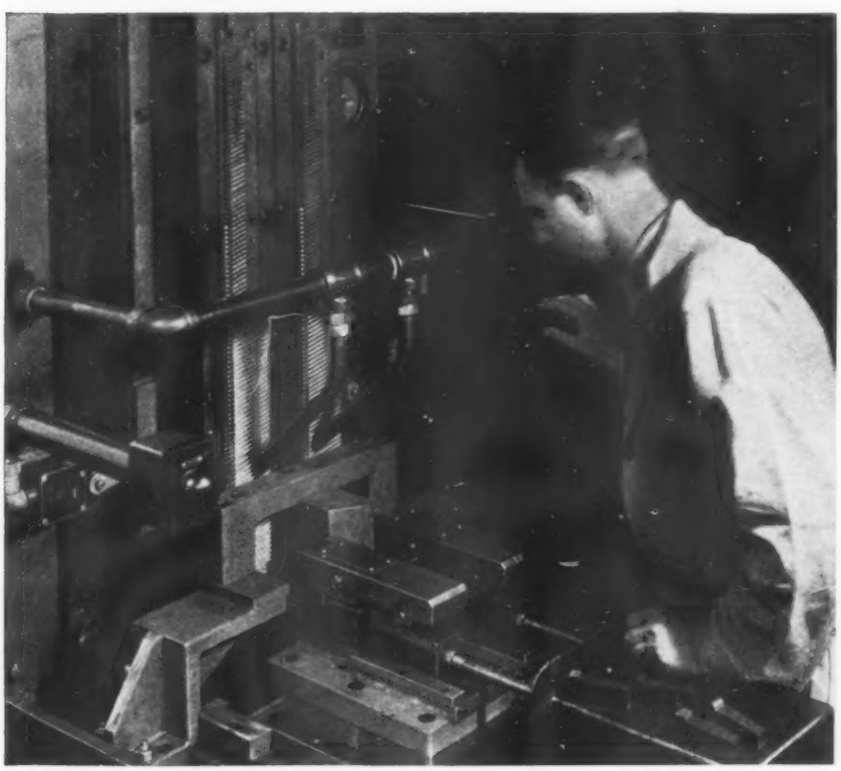
FIXTURE: Dual cam-operated fingers for holding the parts in position until the dual automatic spring-loaded wedge type jaws hold the parts in





position. During the inward motion of the shuttle table, the cam-operated fingers grip the parts on the surfaces to be broached until the vertical jaws securely clamp the part in position, after which the fingers are automatically retracted so that the tools are free to finish broach the entire surface. When the shuttle table is automatically moved to the outward position, the fingers protect the finished parts from falling into the chip and coolant reservoir when the parts are automatically unclamped.





MACHINE: Single-slide vertical broaching machine, 42-in. stroke.

CYCLE: Operator places two rough parts in the fixture and depresses the dual safety control buttons. As the shuttle table moves into broaching position the cam-operated fingers hold the parts in place until the two vertical jaws operated by spring-loaded wedges clamp the part securely in place at which time the fingers are automatically retracted and the vertical tool-slide automatically moves down to broach the parts and stops momentarily as the shuttle table moves out to the loading position. As the shuttle table moves outward the vertical jaws open up and the side fingers hold the parts in place until the shuttle table has returned to the outward position. The tool-slide automatically rises to a starting position and stops. The cycle is semi-automatic. Cutting speed, 30 ft. per min. Return speed, 80 ft. per min.

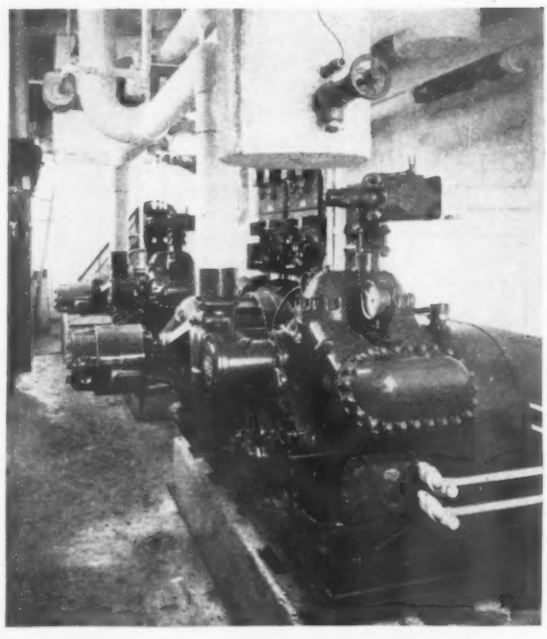
Dust and Rust Are Out

SKF Industries air conditioned its Philadelphia plant to boost product quality. Greater employee comfort and efficiency are profitable by-products

AS WITH OTHER fine mechanisms, precision bearings are in constant danger of damage from dust and rust during manufacture. Assembly, inspection and packing rooms properly sealed can keep out the dust; but only real air conditioning can prevent rust from getting in its deadly work. For humidity above 55 per cent leaves its mark on highly polished pieces.

To prevent formation of rust on finished parts, SKF Industries has installed a complete air conditioning system in its Philadelphia plant. Costing about $75,000, it supplements a number of sealed rooms in which air pressure prevents dust from entering, which have long been used in the plant.

In the new installation, outside air is washed of dust by being drawn through wire mesh screens dipping into an oil bath. This oil bath washes dust from the screens and recoats them for further use. From here the air passes through water screens which cool it below the dew point, thus ridding it of much moisture. After being ionized by 12,000 volts d.c., it is circulated through the plant.



These compact power units handle the entire refrigeration load of the air conditioned departments of the SKF plant in Philadelphia. Both are driven by individual 60-hp. synchronous motors

A constant humidity of 55 per cent and a normal temperature of 72–74 deg. are maintained. In hot weather the temperature is kept between 10 and 12 deg. below that of the outside air. Humidity control prevents formation of even slight rust deposits, and increases the efficiency of employees by making them more comfortable. Rust prevention also eliminates the expense of refinishing, which was often necessary before the air conditioning system was installed.

Assembly department of the SKF plant is but one of several to benefit from the recently installed air conditioning system, which eliminates dust and rust

Housed in a new 850-sq. ft. brick addition, the new equipment conditions the air in the 15,000-sq. ft. area occupied by the assembly, final inspection, and packing and greasing departments. Two 60-hp. synchronous motors drive the two units.

Up to 30,000 cu. ft. of conditioned air per min. is circulated through the conditioned departments. Special annular fixtures in the ducts both distribute the conditioned air and remove used air for filtering, cooling and redistribution. About two-thirds of the air delivered is recirculated in this manner. To reduce both heating and cooling loads on the system, the air conditioned rooms are fitted with windows having double glass with a dead air space between so as to provide insulation.

Lapping for Final Finish

II—What lapping can do was told in a previous article. Here are some practical hints for specific jobs. They're worth trying

By H. J. WILLS
Engineer, the Carborundum Company

FOR FINAL SHAPING and rough finishing dies and molds apply the proper lapping compound to the shaped abrasive stick ordinarily used. The combined action will not reduce cutting speed. On the contrary, the finish will be completely free of grain marks and so reduce the time required for subsequent finishing operations.

Any scratches remaining can be removed by using a 220-grit silicon carbide grease compound on a wood or cast iron stick or lap.

Rough finishing should be done with a driven whitewood or lead lap, or bob, using a 220-grit aluminum oxide grease compound. If the part is too small to permit the use of those tools an orange stick can be used with the same compound.

To remove the grain marks left by the rough finishing, use a chrome leather lap with a 400-grit aluminum oxide grease compound. This will give a finish satisfactory for most dies and molds.

If needed, however, a still better finish can be secured by using the same compound with a lap made of medium hard white felt. For an exceptionally high finish apply a 400-grit aluminum oxide paste with a soft rag lap.

If the shop is equipped to do ultra-finish grinding, plug gages can be ground to size with a surface and finish as good as can be secured by commercial lapping. Otherwise it is necessary to finish ground plug gages with lapping. This may be done by hand or machine. If the ground surface is of high quality, not more than 0.0002 in. need be left for removal by lapping.

Hand lapping is done with a split, adjustable ring-shaped lap of gray iron, using a 220-grit aluminum oxide grease compound for rapid stock removal and a 400-grit compound of the same material for a high finish. If a high luster is desired the gage may be finished by polishing with a cloth and an aluminum oxide paste. The compound is allowed to dry on the surface. A harsh cloth will give a definitely abrasive effect, and a soft canton flannel one a less abrasive effect, using the same compound.

Since the abrasive used in lapping gages crushes easily, it is essential that only a light pressure be used.

If many gages of the same size are to be lapped, it pays to use a lapping machine, which consists of one stationary and one rotatable cast iron plate, with a spider to hold the work. The machine will lap the gages to size with a high quality surface.

If the gages are to be sold, however, it may be desirable to give them a subsequent polishing. This is done on a dry cast iron disk which rotates while the gage is held by hand in a special holder provided with centers which permits the gage to rotate freely at an angle to the radial line of the disk.

Ring gages are lapped with an expanding cast iron or brass lap which is revolved in the hole of the gage at about 250 r.p.m. For small holes a 400-grit aluminum oxide grease compound is used, while the 220-grit compound is used on larger holes. If desired the holes may be polished in the same way as plug gages.

The only difficulty encountered in lapping ring gages is the tendency to lap the hole bell-mouthed. To avoid this, the gages may be made wider than the desired finished dimension. The ends which have been bell-mouthed are then cut off after the lapping operation, leaving a straight hole.

Laps for thread gages are similar to those used for plug and ring gages except, of course, that threads are cut in the working surfaces. It is necessary to reverse the rotation of the gage in order to lap both thread profiles equally and so that the lap will return to its starting point. For threads coarser than 10 to the inch, use an F-grit aluminum oxide soluble oil compound; for finer threads use an FFF-grit compound of the same kind; and for extra fine threads use, or follow with, a 1,000-grit aluminum oxide grease compound.

The lap for thread chasers is a rod on which the proper threads have been cut. For diameters of ½ in. or more, the rod should be made of cast iron. For rods of less than ½ in. diameter brass or copper must be used.

The lap is chucked in a speed lathe with a tailstock center and revolved toward the top of the rest at about 350 r.p.m. If possible, the rest should be adjustable for height and slope so that the chaser when lying flat will be on the correct level and slope. The same compounds as used for thread gages are applied to the lap with a narrow brush. The chaser is held in the hand and pressed lightly against the lap. The lap will move the chaser across the lap until they are out of contact. The chaser is then returned to the starting point and the operation repeated.

F- and FFF-grit aluminum oxide, soluble oil compounds are used.

Lapping the cutting edges of tools of Stellite and cemented carbide will enable them to cut more efficiently and give greater production between grinds. While honing is sometimes used, lapping is faster and gives a squarer, sharper edge.

Lapping is done on a cast iron disk using a silicon carbide soluble oil compound. A small amount of compound is applied to the disk and the tool held so that the disk revolves against and at right angles to the cutting edge. When all sides of the tool have been lapped to a satisfactory edge, a further lapping on a dry disk

will give a semi-polished surface if that is desired. This, however, should be done at five degrees to the cutting edge from back to front. If the tool can be held without tilting, the finishing lap should be done with a swinging motion across the direction of rotation from ninety to zero degrees to the edge and from the back to the front.

If a still higher finish is desired an FF-grit silicon carbide oil compound can be used. It is well to remember that a dull finish may indicate a better surface and so a sharper edge than a highly polished one. For all lapping of these materials top speed is 1,200 s.f.p.m. If a groove must be cut in a cemented carbide tool, it can be done economically by means of an aluminum or brass wheel in connection with the same compound as used for the first lapping operation.

There are two ways to recondition machine bearings. One is to regrind the spindle or shaft to correct out-of-roundness and to remove ridges, and then hand scrape the bearing to a fit. Hand scraping is a laborious operation that requires considerable skill. Even under the best conditions it is rare for the resulting effective bearing area to amount to more than 20 per cent of the total area. The result is that the life of the bearing is comparatively short, and frequent readjustments are necessary to compensate for the rapid wear before the surfaces are "run in".

Running in is in effect a lapping operation without the use of abrasives. But it is slow. It has long been evident that if bearings could be lapped with abrasives a much better bearing surface could be achieved more quickly. But until comparatively recently this has not been practicable, since the abrasives available tended to impregnate the metal of both the bearing and the shaft. Recently, compounds have been developed, consisting of aluminum oxide and grease, which do not impregnate the metals and are economical.

Lapped bearings give as much as 80 per cent bearing surface at the start, require little or no running in, give the bearing longer life and give greater rigidity to the running parts of the machine.

Lapping usually makes regrinding unnecessary as the lapping itself corrects minor out-of-roundness and removes ridges. When grinding is necessary, the subsequent lapping removes the fuzz and so increases the bearing life.

Finally, when bearings are lapped rather than scraped it is usually possible to do the job at the machine location, obviating the need of taking the parts to the maintenance department.

It is sometimes objected that lapping is unsatisfactory because the smooth, uniform surfaces do not provide sufficient irregularities to act as "oil reservoirs". The arguments are more or less convincing in theory, but the fact remains that bearings *are* being lapped and giving excellent results and long life. The answer seems to be that a lapped bearing permits a *complete* separation of the surfaces by an oil film. If this were not so, it would be necessary to re-scrape all bearing surfaces as soon as the surfaces became smooth—i.e., at the time they begin to function best—in order to provide the oil reservoirs.

Since lapping alone will not correct misalignment, this must be accomplished by scraping.

Here are a few general points to keep in mind when lapping bearings. During the operation some end movement or oscillation is needed to prevent grooving. When lapping tapered bearing surfaces the shaft must be frequently raised from its seat to allow the compound to flow to the tapered ends. For all types of bearings it is advisable to add a few drops of machine oil occasionally to replace that taken up by the metal and the cuttings.

It is essential to clean the parts after lapping, first with a brush dipped in any oil solvent other than gasoline, and then with a washing in hot soap and water.

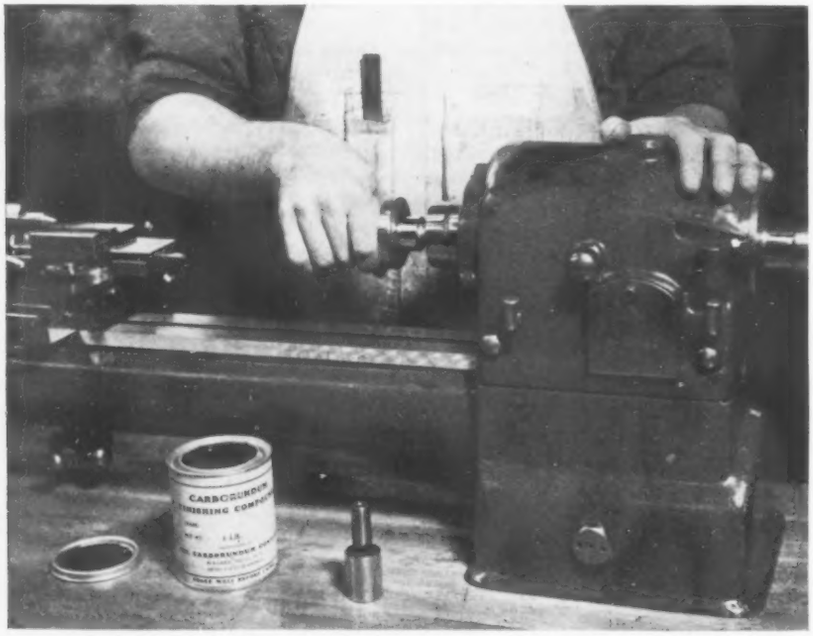
Specifically, machine tool mandrels are lapped as follows:

They may be driven either by hand with a twisting movement, or by power through a very light belt, just taut enough to turn the mandrel. The compound may be applied through the regular oil holes or directly to the surface before assembling. Adjust the bearings after the abrasive has been applied so that only a slight drag is felt when the mandrel is turned by hand. Too much pressure may crush the soft abrasive crystals before they have started to cut.

Apply 220-grit compound and rotate spindle with some oscillation for several minutes. Examine the surface and if more lapping is required add more compound and machine oil. Continue until the surface appears dark gray over the entire bearing area. Maintain a slight drag by frequent adjustment of the lapping tool or machine.

Clean the surfaces thoroughly and repeat the operation using a 600-grit compound, until the surfaces appear a lighter gray. Continue, using machine oil in increasing quantities until practically all of the compound has been eliminated. Make a final adjustment to a slight drag, and run for five or ten minutes with oil only.

Clean all parts thoroughly and reassemble. The bearing is now ready for service.



Mounted in a bench lathe, a plug gage is finished lapped using a cast iron ring lap and a 400-grit aluminum oxide abrasive

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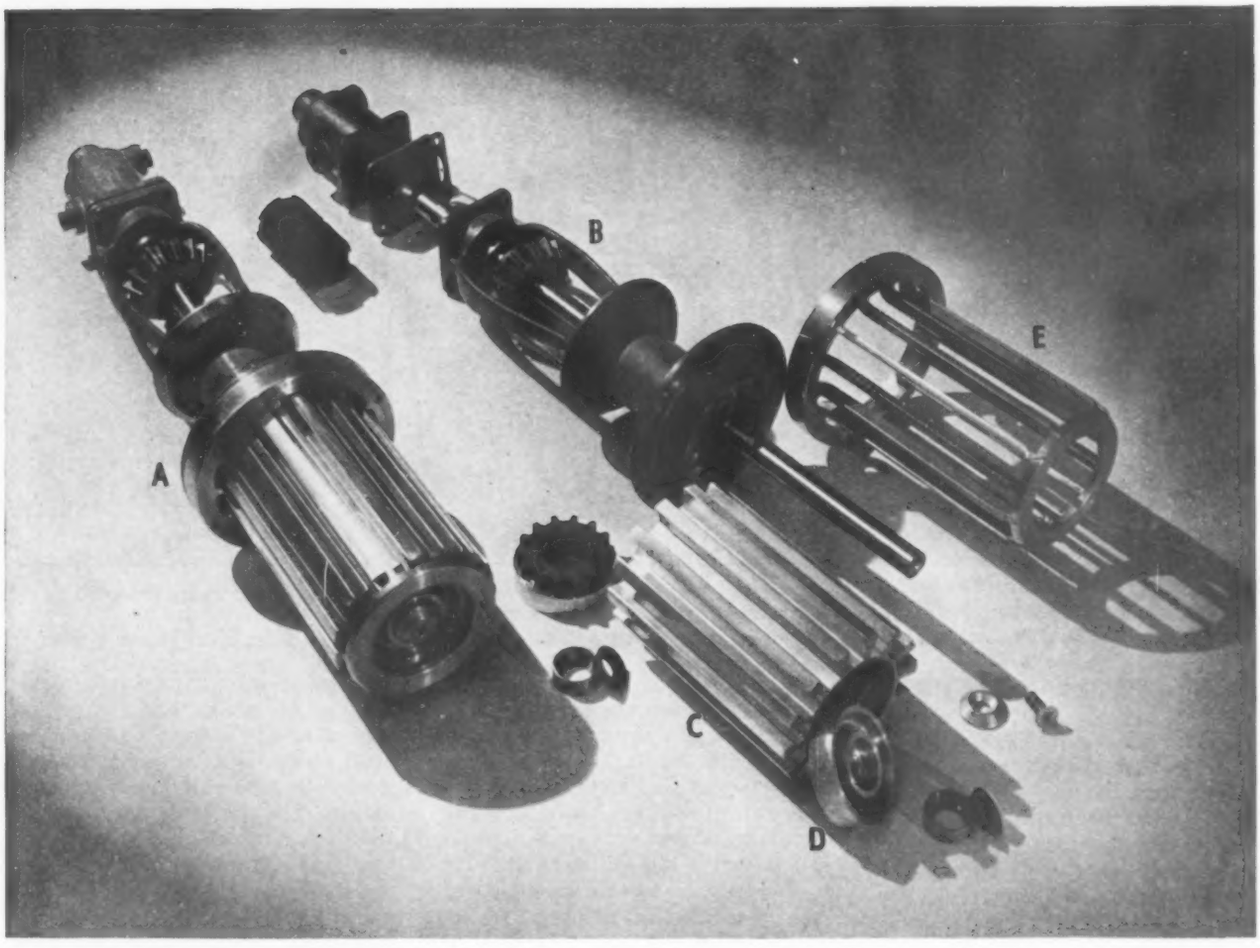
The third installment of this article will appear in an early number.



Details of Drying Reel—At A *is the complete assembly;* B, *drive mechanism and hollow shaft for water circulation;* C, *extruded reel sprocket;* D, *forged sprocket head; and* E, *permanent-molded spider*

Accuracy in Aluminum

Thousands of aluminum parts had to be machined to close tolerances with extremely smooth surfaces. For a while vibration on interrupted cuts had the shop stymied. Ingenious wrinkles saved the day

By L. A. COREY
Superintendent, Rayon Machinery Corporation

UNCONVENTIONAL METHODS of processing materials often lead to unusual machining problems in building the equipment. A case in point is the fabrication of aluminum drying reels which are part of the continuous rayon-yarn processing machines recently developed by Industrial Rayon Corporation. These reels, consisting mainly of a sprocket and a spider, had to be machined to close tolerances and finished with a highly polished surface. The 96 100-end machines built by Rayon Machinery Corporation, a subsidiary, required 9,600 of them.

Fabrication of the sprocket and spider from aluminum alloys (desirable for their high heat conductivity) appeared at first to be an insurmountably expensive job. Not only would the cost of removing much metal from the solid or from heavy-wall tubing have been prohibitive, but the problem of holding the parts and getting the required accuracy had caused vendors plenty of trouble in experimental lots. If 9,600 reels were to be built, other methods had to be found. Finally it was decided to have the sprocket extruded by Bohn Aluminum & Brass Corporation, and to have that company permanently mold the spider also. That decision took care of the problem of stock removal in large quantities. But it remained for Rayon

Machinery to devise methods of holding the parts while being finish machined and of obtaining the required dimensional accuracy and surface smoothness.

Smoothness is just as important as accuracy. The yarn passing over reels is composed of a huge number of tiny filaments, and snagging of a single filament will cause fuzzing and breaking. Continuous processing of yarn will not permit breaks. That the required surface smoothness has been secured is shown by the fact that from 35 to 85 miles of yarn, depending on its size, is now wound on bobbins without any breaks.

Machining the Sprocket Assembly

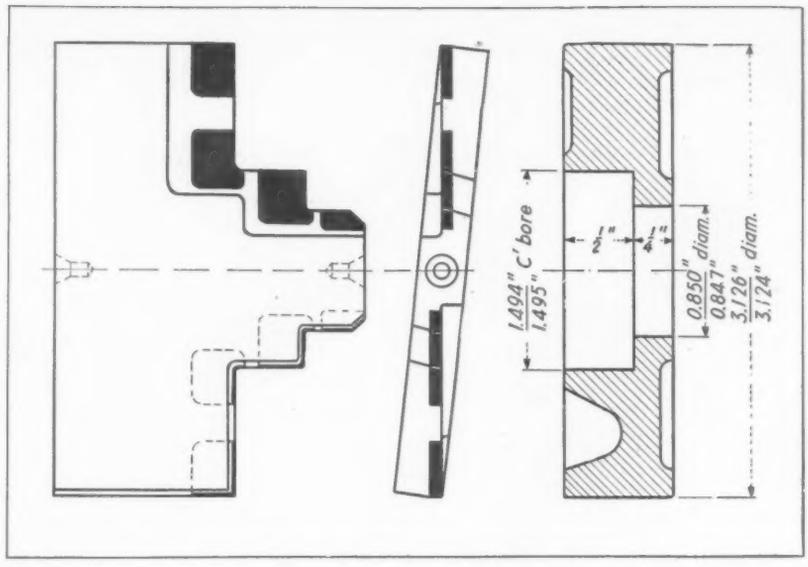
Preliminary operations on the extruded sprocket consist of counterboring both ends to 3.114–3.116 in. and facing to length. The part is held on an expansion mandrel. Spindle speed is 1,012 r.p.m., and the feed 0.0027 in. Carboloy tools are used at a spindle speed giving 830 surface ft. per min.

Operations on the forged aluminum sprocket head consist of: (1) bore, counterbore and face one end while holding the part in a three-jaw chuck, and (2) face opposite side, turn the outside diameter and chamfer one edge while holding the part on a stub arbor. Both operations are performed simultaneously on a two-spindle Heald. The first operation involves a plunge cut using a combination flat Carboloy cutter. Over 19,000 heads have been machined without losing size on the one tool. On the second operation the part grew 0.007 in. when bone dry. Copious flooding with coolant reduced growth to zero.

After being finished, these heads are then inserted in the ends of the sprocket. Sprocket counterbores are 3.114–3.116 in. in diameter, whereas the heads are 3.124–3.126 in. in diameter. Therefore the heads must be shrunk 0.010–0.012 in. in dry ice and then inserted in the sprocket counterbores. When they warm up, the tight expansion fit (metal to metal) insures that there will be no leakage of the hot water circulated inside the reel to dry the yarn.

Operations on the permanent-molded spider are: (1) face and form the radius on the small end, and (2) turn and face both sides of the flange and counterbore the large end. Here a spindle speed of 758 r.p.m. is used because of the larger diameter of 5 in.

Next the spider is slipped over the sprocket and the two held on a special double mandrel for turning the outside diameter of the sprocket teeth and of the spider bars. This operation must produce the smooth surface essential in preventing breakage of the yarn filaments. Final finishing must take out feed marks scarcely visible to the naked eye. All machining on the spider and sprocket is done on a Monarch 5 T manufacturing lathe.



A Carboloy cutter machines three surfaces on the sprocket head, as indicated by heavy lines, in 35 seconds

For several weeks the shop puzzled over a method of holding the cast spider and extruded sprocket so as to prevent vibration and chatter. Caused by the interrupted cut, these conditions were further aggravated by the fragility of the spider bars. Finally a simple expedient was hit upon. Lengths of ordinary rubber channel stripping, such as is used in automobile windshields, were placed along the inner side of the spider bars, wedged between alternate sprocket teeth. The rubber damped the vibration completely. Roughing and finishing tools in the dual front tool block are set about 28 deg. apart, so that one is cutting a sprocket tooth tip while the other is cutting a spider bar. The turning operation is carried out at 1,300 r.p.m. with 0.002 in. feed, at a surface speed of 1,700 ft. per min. The two parts are faced to length in the same set-up, because they grow from strain relief.

Control of Size Difficult

Rayon Machinery has found that size of aluminum parts can be controlled only by using the greatest stream of coolant that the machine will afford. While handling would be expedited if no coolant were used, in the above set-up the sprocket would grow 0.015 in. in diameter and the spider only about 0.005 in., since the extruded sprocket has a greater coefficient of expansion than the permanent-molded spider. Furthermore, upon cooling the extruded material would not return absolutely to original size. The end of the cut would be approximately 0.010 in. undersize when cooled, not 0.015 in. Because of the dissimilar coefficients of expansion of the two parts, a compensating camber bar could not be used. But with the full flow of coolant and an extra-large sump, the parts do not grow at all. Sufficient capacity is needed in the sump to maintain a coolant temperature of 75 F. Necessarily, the machine is allowed to warm up before parts are machined.

Fast Freight

Mainline British railways continue their policy of speeding up railway freight services, according to *Industrial Britain*. Every 24 hours 678 express freight trains are run, the fastest averaging 45 m.p.h.

Acceleration in services up to 160 minutes have been made with thousands of schedules overhauled to effect morning arrivals. The general acceleration of freight services on British railways has been made possible by the construction of a large number of freight cars fitted with automatic brakes and by the use of more powerful locomotives.

Regular express freight trains are now run on fixed daily schedules, the journeys in a number of instances covering distances over 100 miles without stop.

More Metal Per Grind

Proper use is as important as proper selection in the application of carbide-tipped cutting tools. Each job requires separate consideration

By F. DEAK
Staff Supervisor, Factory Service Division
Westinghouse Electric and Manufacturing Company

RECENT YEARS have seen great progress in the development of cutting tool materials. Much improvement has been made in the old and well-known tungsten high-speed tool steels (18–4–1). Considerable research has created tungsten super-high-speed tool steel (18–4–2), tungsten-cobalt high-speed tool steel (18–4–1+4) and (18–4–2+8), super-tungsten-cobalt high-speed tool steel (22–5–1–1.50+12), Stellite, and molybdenum high-speed tool steel, and finally, has introduced tungsten carbide as a suitable cutting material.

Tungsten carbide tools, of course, do not eliminate the use of these other cutting materials which will continue to be in demand because of their adaptability to certain applications. Sintered carbide tools, correctly used, will give excellent results in machining such materials as cast iron, malleable iron, bronze, brass, fiber and laminated plastics. Chilled cast iron, extremely hard, has also been successfully machined with sintered carbide tipped tools. Since the introduction of tungsten-titanium, tungsten-tantalum and tungsten-titanium-tanalium carbides, 40–50 carbon steel heat-treated as high as 310 Brinell, nickel steel and high manganese steel have been machined successfully with carbide-tipped tools.

One notable example of the adaptability of tantalum or titanium carbide tipped tools to the machining of steels is the manner in which a large diameter, 40–50 carbon steel piece heat-treated to 602–607 Brinell hardness can be machined. This operation

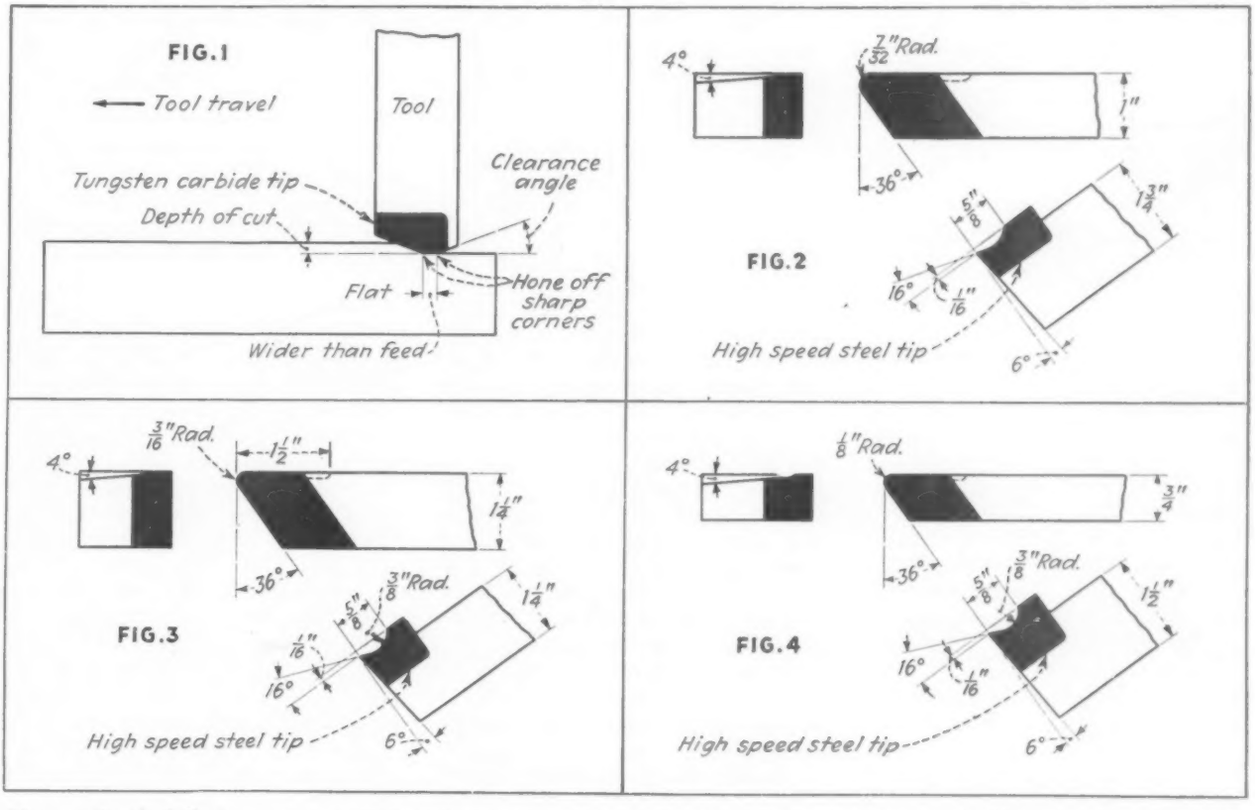


Fig. 1—Hard chilled cast iron is machined readily with the tool shown. It is suitable for both boring mill and lathe operations. Figs. 2, 3 and 4—High-speed steel tool tips are ground with chip breakers as shown for turning soft steel

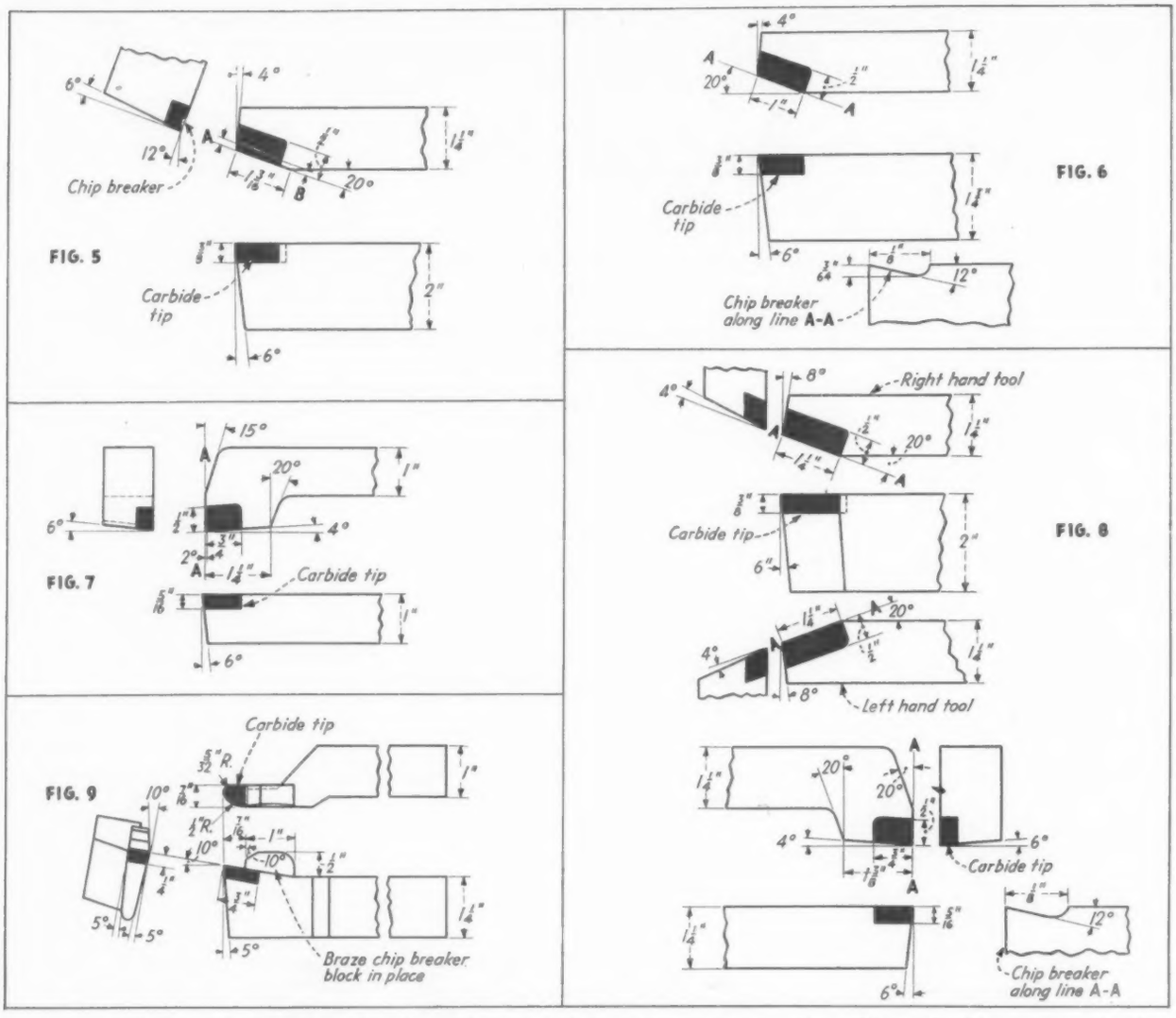


Fig. 5—Tough but soft forged steel, axle steels and nickel steels can be turned readily with this tungsten-titanium carbide tipped tool. Values for dimensions **A** *and* **B** *are given in the text. Figs. 6 and 7—A 12-deg. chip breaker is satisfactory for turning 40–50 carbon forged steel heat-treated to 285–300 Brinell hardness with tungsten-titanium tipped tools. Fig. 8—These three tools have breaker grooves suitable for turning nickel steel when tips are made of tungsten-tantalum carbide. Fig. 9—Chip breaker blocks, mounted above and behind the tool tip soon wear off when cutting pressures are high*

used a cutting speed of 42 ft. per min., a feed of $\frac{1}{16}$ in. per revolution and a $\frac{1}{8}$-in. depth of cut. Nickel steel bars 6 in. in diameter have been machined with a cutting speed of 170 ft. per min., a feed of 0.024 in. per rev. and a $\frac{1}{4}$- to $\frac{3}{4}$-in. depth of cut; also heat-treated axle steel bars 7 in. in diameter are turned at 185 ft. per min. with 0.028 in. feed and $\frac{1}{4}$- to $\frac{3}{4}$-in. depth of cut. Perhaps the most convincing demonstration of the savings effected by the use of tungsten, tantalum and titanium carbides is the fact that they have been adopted by many manufacturers for mass production operations.

Several factors govern the use of sintered carbide tipped tools. First to be considered is the condition of the machine tool. By eliminating chatter and vibration, having rigid tool support and little overhang we can increase tool life considerably. The operator must not stop or stall the machine with the tool in the cut and the feed engaged.

Secondly, considerable attention should be paid to the size of both tip and shank. Larger tips and larger shanks stand the shock and carry the heat of the cut better. In order to select the proper grade of sintered carbide and the proper cutting conditions, such as speed, feed and depth of cut, we should endeavor to learn as much as possible about the material to be machined.

Another factor that should be given careful consideration is the selection of proper clearance angles. It is important to keep all of the angles down to a minimum which will permit free cutting. Doing this obtains added support for the cutting edge which, in turn, increases tool life. A familiar adage used by tool engineers and toolmakers is to the effect that "a tool is no better than its heat-treatment." In my opinion, a cutting tool is no better than the method by which it was ground.

In machining most cast iron, use speeds of 140 to 245 surface ft. per min., feeds of 0.040 to 0.085 in. per rev. and a $\frac{1}{4}$- to $\frac{3}{4}$-in. depth of cut. In addition to the standard single-point cutting tools, special form tools, counterbores and reamers with carbide tips are useful on different applications.

Tugsten carbide is especially adaptable to the machining of very hard

chilled cast iron. A longitudinal feed, as shown in Fig. 1, is used on both the boring mill and the engine lathe. Note the shape to which the tool is ground. Feed frequently is $\frac{3}{16}$ in. per revolution.

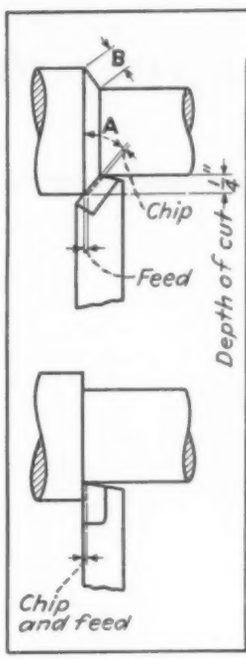
During the past few years considerable progress has been made in the cutting of soft and hard steel, and steel castings, with tantalum or titanium carbide tipped tools. These tools must be of correct shape and form. Here again, we emphasize the importance of correct angles—particularly in machining steel.

In cutting steel without a chip breaker, the chip will flow in straight ribbon form. Such straight chips, as well as those which curl in large circles, are difficult to handle and are dangerous to the operator. In many instances they twist around the tool, causing it to break. It is, therefore, a common practice to grind a small groove in the face of the tool to serve as a chip breaker. It causes the chip to curl into a tight helix and break off in small sections.

It is important to use the correct type of chip breaker when cutting steel with tantalum or titanium carbide tipped tools because of the high cutting speeds, especially when cutting extremely tough but soft steels with 60 to 65 carbon and 60 to 80 manganese. It also is necessary to have the correct chip breaker when cutting forged steels of 40 to 50 carbon, heat-treated to 285–300 Brinell, or when cutting nickel steel. Considerable research has been done trying to develop chip breakers for high-speed steel and Stellite tools, as well as for tools tipped with tantalum or titanium carbides.

Each type and style of cutting tool, as well as the material to be machined, requires separate consideration. If the grooves are ground too deep or too wide and not on a radius from the cutting edge, we find that the chips are not curled. The cutting grooves cause the tools to spall, and the high pressure exerted by the chips will cause the cutting edge to break. The sketches show proper chip breakers for most conditions.

Figs. 2, 3 and 4 show standard high-speed steel tools with chip breaker grooves for cutting soft steel. Fig. 5 shows a standard tungsten-titanium carbide tipped tool with the breaker groove used for extremely tough, but soft, forged steel. Dimension *A* usually is $\frac{5}{32}$ in. for nickel steel, $\frac{3}{16}$ in. for heat-treated axle steel and $\frac{1}{4}$ in. for soft steel. Dimension *B* then is $\frac{3}{32}$, $\frac{5}{32}$ and $\frac{7}{32}$ in. respectively for the same materials. Figs. 6 and 7 show tungsten-titanium tipped tools with the chip breaker necessary for cutting 40–50 carbon forged steel heat-treated to 285–300 Brinell hardness. Fig. 8 shows three tungsten-tantalum carbide tipped tools with breaker grooves for nickel steel.



FEED		ANGLE OF TOOL POINT							
		0.005 Chip	0.010 Chip	0.015 Chip	0.020 Chip	0.022 Chip	0.023 Chip	0.025 Chip	0.028 Chip
0.024	A	78°	65½°	51½°	33½°	20°	15°		
	B	1 3/16	0.543	0.314	0.165	0.085	0.054		
0.032	A	81°	71°	61°	50°	46½°	44°	36°	25½°
	B	1 19/32	3/4	15/32	5/16	17/64	1/4	3/16	1/8
0.062	A	85½°	80½°	76°	71°	69½°	68¼°	66°	63°
	B	3 3/16	1½	1	3/4	21/32	5/8	9/16	1/2
0.093	A			81°	77½°	76¼°	75¾°	74¼°	72½°
	B			1 19/32	1 1/8	1 1/32	1	24/32	13/16
0.125	A			84°	80¾°	79¾°	79½°	78½°	77°
	B			2 3/8	1 17/32	1 3/8	1 11/32	1¼	1 3/32
0.187	A				83¾°	83¼°	83°	82½°	81½°
	B				2 5/16	2 1/8	2 1/32	1 29/32	1 11/16
0.25	A						85°	84¼°	83½°
	B						2 7/8	2½	2 3/16

Fig. 10—Best results are obtained when cutting edge is set at an angle with the work, especially when roughing with a heavy cut

There are chip breakers made with an additional piece that is either brazed or clamped on the top of the tool as in Fig. 9. This additional piece is supposed to form the chip into a spiral of small radius which breaks up against the work or tool and comes off. The high pressure exerted by the hot chip wears off this additional piece, and the chip again flows in a long ribbon form. Tungsten carbide was used for this additional piece, but even this high wear resistant material would not stand up against this high pressure very long. Grinding the chip breakers into the tips has given the best results.

Tungsten-titanium or tantalum carbide tools especially adapted for heavy roughing will give the best results if the cutting edge is made at an angle. Fig. 10 illustrates this statement, showing the tool set to cut straight and also to an angle of 20 deg. Assume that the material to be machined is a tough chrome-nickel steel and the tool is set at right angles to the work. The feed is 0.024 in. per revolution, the cutting speed is 225 ft. per min., and the depth of cut $\frac{1}{2}$ in. The chip thickness is also 0.024 in. Now when the tool is set with a 20 deg. cutting edge, same feed, speed and depth of cut, the chip thickness is less than the feed. As the angle increases, the chip thickness decreases. The chip thickness equals feed times cosine of the angle. This lightens the burden on the tool, inasmuch as the angle widens the chip and curls away from both the tool and the work. At the same time, it removes the same amount of metal in cubic inches per minute, gives a longer tool life, less breakage and therefore, less cost per tool to remove more metal per grind

Grinding Wheel Hole Standards

One automotive manufacturer is standardizing on wheel mounts to minimize the number of hole diameters in stock. When a wheel wears below a given minimum diameter for one machine it can be shifted to another requiring that diameter and having the same mount. The practice has eliminated 158 stock sizes. The standard wheel diameters and mount diameters are:

Wheel O.D.	Mount. Diameter
C-$\frac{1}{2}$	$\frac{1}{8}$ in. hole
$\frac{17}{32}$-$\frac{81}{32}$	$\frac{1}{4}$ " "
$\frac{1}{4}$	$\frac{3}{8}$ " "
4-12	$1\frac{1}{2}$ " "
$12\frac{1}{32}$-18	5 " "
$18\frac{1}{32}$-42	12 " "

Camshaft wheels will retain the 18-in. hole for the present.

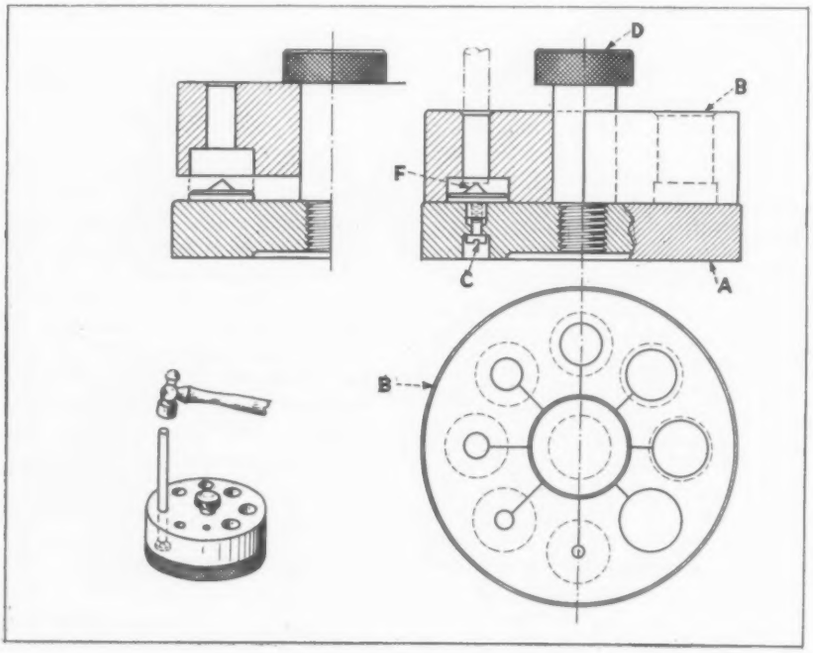
IDEAS FROM PRACTICAL MEN

Centering Device

By F. DOUGHTY
Shipley, Yorkshire, England

The tool illustrated is for prick punching the centers in small shafts preparatory to drilling and countersinking. Essentially it consists of the base *A;* the rotatable member *B;* the screws *C* and *D;* and the center punch *F*. The base is knurled for a finger grip and contains the hardened center punch, which is secured by screw *C,* and is tapped for the knurled shoulder screw *D*. The rotatable member is pivoted on screw *D* about which it can be revolved as a center. It has eight equally-spaced holes of various diameters to suit the diameters of the shafts to be centered. The lower ends of all the holes are counterbored to fit over the body of the center punch, which serves as an index pin for the rotatable member.

In operation, the rotatable member is lifted up to clear the point of the center punch and is rotated to bring the desired hole over it. It is then let down so that the counterbored part of the hole engages the body of the center punch, locking it in position. The shaft to be prick punched is entered in the hole, its lower end resting on the point of the center punch. The upper end of the shaft is struck with a hammer, as shown in the small view at the lower left, the hammer blow driving the lower end onto the center punch and making an indentation. The shaft is then removed, turned end for end and reentered in the hole and the operation is repeated.



Preparatory to drilling and countersinking, the centers of small shafts of various diameters are prick punched in this simple tool

Tool Trucks That Save Time

Much time is lost in many shops by not having the right wrench or other tool available when making repairs to machines and equipment. The truck shown is one of several in the shops of the Churchill Weavers, Berea, Ky. Whenever a job is to be done the tool truck goes along. As will be seen this carries a very complete line of wrenches. The three black outlines on the end show that the wrenches belonging on those pegs are missing. The socket wrenches on the side with screw-driver handles are most convenient in some cases. At the top is a very complete set of loose sockets with suitable handles.

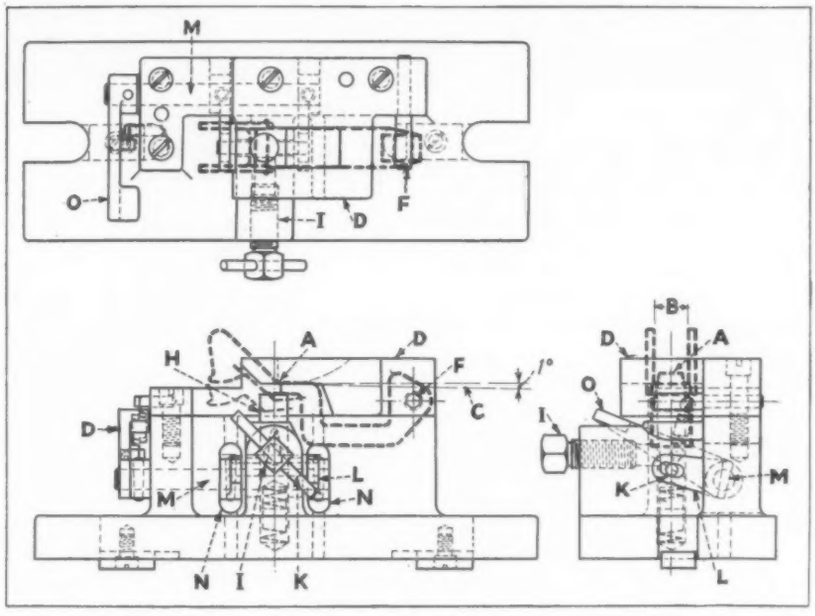
The wrench supporting pyramid of this tool truck turns on the triangular base. Large, rubber-tired, swiveling casters make it easy to move the truck anywhere in the shop

Fixture for Match Milling

By H. SCRIBNER

To complete the milling of the part indicated by heavy dashed lines in the accompanying illustration, it is necessary to make what is known as a matching cut. The metal to be removed is the small triangular hump *A* between the walls *B*. Since it is necessary that the cutter clear the surface *C* which has been milled in a previous operation, the cut is made at an angle of 1 deg. from the previous cut, permitting the cutter to be brought close to surface *C* without actually touching it.

The under side of block *D* is at an angle of 1 deg. with the horizontal and is used for locating the work which is pivoted on the stud *F* and is held up by the spring jack *H*. The jack is locked in position by the screw *I* which has a beveled shoe



Work is held in this fixture at a diverging angle of 1 deg. with the horizontal so that the cutter will clear the surface milled in a previous operation

ahead of it. In the spring jack is the cross pin *K* passing through a clearance slot in the fixture and engaging which are the two short levers *L* pivoted on shaft *M* and operating in slots *N*. On the outer end of shaft *M* is the finger lever *O* by which the spring jack can be depressed through levers *L* and against the pressure of its spring.

To remove the work, screw *I* is backed off and the finger lever *O* is pressed down, pulling down the spring jack so that the work can be swung downward on stud *F* and removed from the front of the jig.

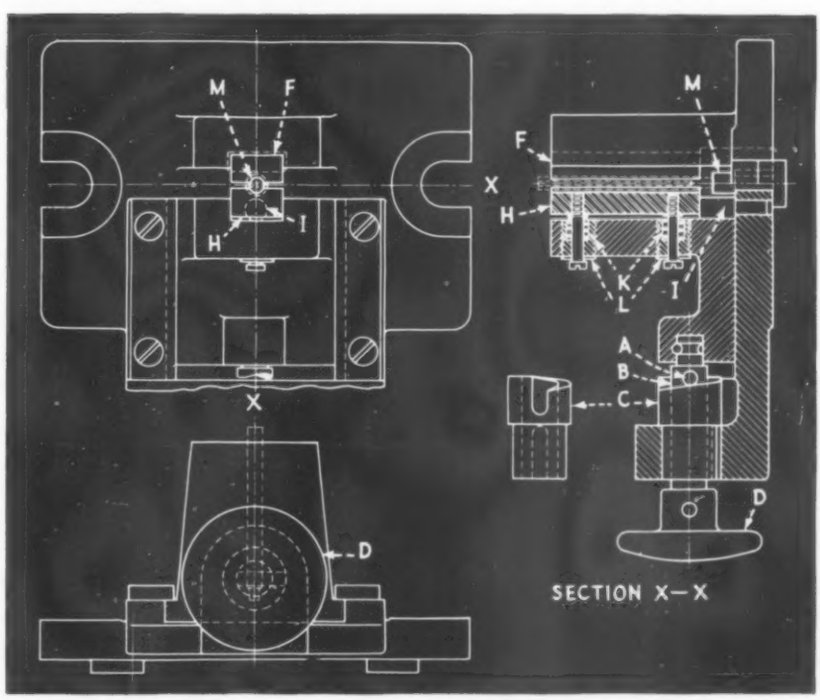
Slitting Fixture

By EDWARD L. PETERSON

The fixture illustrated is for slitting draftsmen's ruling pens. The body of the fixture is a vise in which the movable jaw is operated by a cam. The pin *A* in shaft *B* bears on a cam face on the inner end of bushing *C* and closes the movable jaw when the knob *D* is turned clockwise. A slot in bushing *C* permits pin *A* to enter so that the movable jaw can be drawn back for loading by pulling out knob *D*. The auxiliary jaw *F* is pressed into a vertical slot in the stationary jaw and is fastened by screws. The auxiliary jaw *H* is a slip fit in a vertical slot in the movable jaw, its lower end resting on the shoulder pin *I*. Both auxiliary jaws have V-grooves in their faces in which the work is placed.

The amount of travel of the movable jaw is controlled by the amount of rise and fall of the cam on bushing *C*. Auxiliary jaw *H* is pushed outwardly in the movable jaw by springs *K*, the pressure of which is adjusted by turning the threaded bushings *L*, so that when the movable jaw is closed to its limit by the cam, the slit being sawed in the work will not be closed enough by spring pressure to pinch the saw and cause it to break.

In operation, the blank to be slit is placed between the auxiliary jaws, its lower end resting on the shoulder pin *M*. The movable jaw is then closed to its limit by turning knob *D* clockwise so that the blank is held by pressure of the springs.

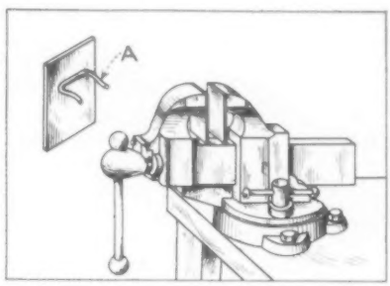


When slitting ruling pens with this fixture the blanks are held by the pressure of springs which must be so adjusted as to prevent the slits from closing in and pinching the saw

Soft Auxiliary Jaws for the Bench Vise

By MARTIN H. BALL

Many kinds of work held in the bench vise would be injured unless protected by some soft material. Such protection generally takes the form of sheet copper formed to fit



Soft auxiliary jaws for the bench vise are held by clips of spring wire and can be reversed to give longer life

the jaws. The main objection to such protection is that the edges of the copper are more or less rounded where they are bent over the jaws, making it difficult to hold short work that must project above the jaws enough to be worked upon without tipping or loosening both the auxiliary jaws and the work.

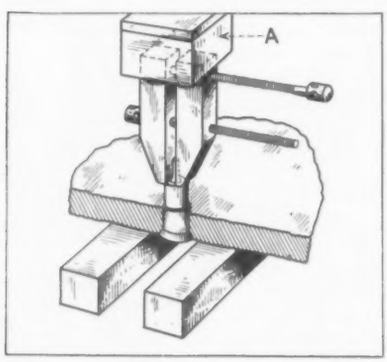
To overcome that objection, soft auxiliary jaws of the type illustrated were made. Clips *A* of spring-tempered wire soldered to their backs are formed to fit over the necks of the jaws and hold them in place. The advantages are that being of the same width as that of the vise jaws and of a depth equal to the distance from the tops of the jaws to the top of the sliding member, they permit short work to be held close to the tops and sides of the jaws. The soft jaws are reversible and can be used with either edge up, which gives them considerably longer life.

Since they do not project above the tops nor beyond the sides of the jaws, they are backed by the jaws at all points. If the soft jaws are made from non-metallic material, the spring clips can be attached to them with no trouble at all by means of staples.

A Parallel Clamp Used to Remove Slender Punches

By H. R. HAGEMAN

It is sometimes necessary to remove a slender piercing punch of conventional design from the punch pad. Regardless of whether the punch is to be removed before or after it has been heat-treated, driving or pressing on its end is out of the question because of danger of bending or breaking it. In the absence of a special sleeve or other tool, a parallel clamp can be used successfully, as illustrated.



Slender piercing punches can be removed from the punch pad without danger of breakage by a parallel clamp used in an arbor press

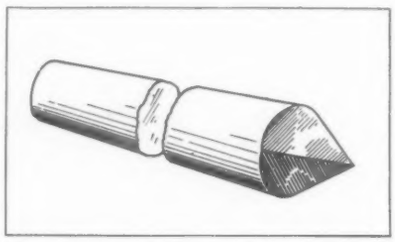
The punch pad is placed on parallels in an arbor press and the ends of the clamp jaws are placed on the shoulder of the punch, the ram *A* pressing on their opposite ends.

To facilitate removal of such a punch it is good practice to turn that part of the body projecting beyond the pad slightly smaller than the part pressed into it; also to face a portion of the shoulder square to provide a seat for the tool used to press it out. Both of these suggestions are indicated in the sketch.

Triangular Center Replaces Dog When Finishing Taper

By ARTHUR HAVENS

In turning or grinding tapers where the work must be removed from the machine several times to try the fit in the hole, the nuisance of having to remove and replace the driving dog each time the fit is tried



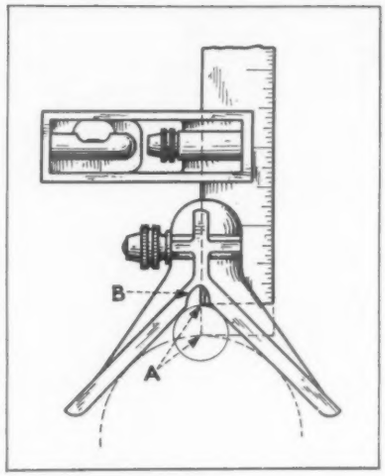
A triangular live center can be used when finishing bolts and pins to the correct taper; hence, the driving dog does not have to be removed and replaced each time the piece is chucked

and the work is replaced in the machine can be obviated by making the point of the live center triangular in shape. The countersunk center hole in the work is made to fit the center by a punch of the same shape. Such a center will drive the work under the light cuts necessary in turning or grinding tapers, and no dog is necessary. For the work to run dead true it is, of course, necessary that it be placed on the live center in the same position each time it is returned to the machine.

Locating the High Spot on Round Work

By WILLIAM S. ROWELL

In drilling a crosshole in a shaft or other round work, if the location of the hole has been prick punched before the work is clamped for drilling, it is difficult to bring the punch mark to the high spot for starting the drill so that the hole will be drilled through the center. If the high spot should be located and marked after the work has been clamped, it would be equally difficult to locate it.



With the scale and the center head of a combination square used as described, the high spot on round work can be found with a reasonable degree of accuracy

But one of our drill-press operators has found that by using the scale and the center head of his combination square, having a level attached to the scale so it will indicate when the scale is vertical, as shown in the illustration, he can locate the high spot in the work with reasonable accuracy. With the center head resting on the work, the scale is pushed down until it contacts the work. Rotating the center head on the work until the level indicates that the scale is vertical, the high spot is marked from the corner *A* of the scale by a scriber. When the location of the hole has been prick punched before the work is clamped, the center head is rotated on the work until the corner of the scale splits the punch mark. Then the work and the center head are rotated in unison until the level indicates that the scale is vertical. The punch mark is then very nearly at the high spot.

When the work is small in diameter, as indicated by the full lines, a notch filed in the center head at *B* will make it easy to use the scriber. But if the work is large in diameter, as shown by the dotted lines, there is no need for the notch. Locating the high spot by either of these means, the operator can drill the hole with reasonable assurance that it will pass through the center of the work.

Weight and Cost of Rolled Steel Flats

By HAROLD A. VALENTINE

Atlantic Manufacturing Company

WEIGHT AND COST PER INCH

1/4	WGT.	5c	10c	15c	25c	35c
1/4	0.0177	0.0008	0.0017	0.0026	0.0044	0.0062
1/2	0.0354	0.0017	0.0035	0.0053	0.0088	0.0120
3/4	0.0531	0.0026	0.0053	0.0079	0.0130	0.0190
1	0.0708	0.0035	0.0071	0.0110	0.0180	0.0250
1 1/4	0.0885	0.0044	0.0090	0.0130	0.0220	0.0310
1 1/2	0.1062	0.0050	0.0110	0.0160	0.0270	0.0370
2	0.1416	0.0070	0.0140	0.0210	0.0350	0.0500
2 1/2	0.1771	0.0090	0.0180	0.0270	0.0440	0.0620
3	0.2125	0.0110	0.0210	0.0320	0.0530	0.0740
3 1/2	0.2479	0.0120	0.0250	0.0370	0.0620	0.0870
4	0.2833	0.0140	0.0280	0.0430	0.0710	0.0990
4 1/2	0.3187	0.0160	0.0320	0.0480	0.0800	0.1120
5	0.3541	0.0180	0.0350	0.0530	0.0890	0.1240
5 1/2	0.3895	0.0200	0.0390	0.0580	0.0970	0.1360
6	0.4250	0.0210	0.0430	0.0640	0.1060	0.1490

5/16	WGT.	5c	10c	15c	25c	35c
5/16	0.0276	0.0014	0.003	0.004	0.007	0.010
1/2	0.0441	0.0020	0.004	0.007	0.011	0.015
3/4	0.0662	0.0030	0.007	0.010	0.016	0.023
1	0.0883	0.0040	0.009	0.013	0.022	0.031
1 1/4	0.1104	0.0050	0.011	0.016	0.028	0.039
1 1/2	0.1324	0.0070	0.013	0.020	0.033	0.046
2	0.1766	0.0090	0.018	0.026	0.044	0.062
2 1/2	0.2208	0.0110	0.022	0.033	0.055	0.077
3	0.2649	0.0130	0.026	0.040	0.066	0.093
3 1/2	0.3098	0.0160	0.031	0.046	0.077	0.108
4	0.3541	0.0180	0.035	0.053	0.088	0.124
4 1/2	0.3984	0.0200	0.040	0.060	0.100	0.139
5	0.4427	0.0220	0.044	0.066	0.111	0.155
5 1/2	0.4869	0.0240	0.049	0.073	0.122	0.170
6	0.5312	0.0270	0.053	0.080	0.133	0.186

3/8	WGT.	5c	10c	15c	25c	35c
1/2	0.0533	0.0026	0.005	0.008	0.013	0.018
3/4	0.0799	0.0040	0.008	0.012	0.020	0.028
1	0.1066	0.0050	0.011	0.016	0.026	0.037
1 1/4	0.1333	0.0070	0.013	0.020	0.033	0.046
1 1/2	0.1599	0.0080	0.016	0.024	0.040	0.056
2	0.2133	0.0110	0.021	0.032	0.053	0.075
2 1/2	0.2666	0.0130	0.026	0.040	0.067	0.093
3	0.3199	0.0160	0.032	0.048	0.080	0.112
3 1/2	0.3718	0.0180	0.037	0.056	0.093	0.130
4	0.4249	0.0210	0.042	0.064	0.106	0.149
4 1/2	0.4781	0.0240	0.048	0.072	0.119	0.167
5	0.5312	0.0260	0.053	0.079	0.133	0.186
5 1/2	0.5843	0.0290	0.058	0.087	0.146	0.204
6	0.6375	0.0320	0.064	0.095	0.159	0.223

1/2	WGT.	5c	10c	15c	25c	35c
1/2	0.0708	0.0035	0.007	0.011	0.018	0.025
3/4	0.1062	0.0050	0.011	0.016	0.026	0.037
1	0.1416	0.0070	0.014	0.021	0.035	0.049
1 1/4	0.1770	0.0090	0.018	0.026	0.044	0.062
1 1/2	0.2124	0.0110	0.021	0.032	0.053	0.074
2	0.2833	0.0140	0.028	0.042	0.071	0.099
2 1/2	0.3541	0.0180	0.035	0.053	0.089	0.124
3	0.4249	0.0210	0.043	0.064	0.106	0.149
3 1/2	0.4958	0.0250	0.050	0.074	0.124	0.174
4	0.5666	0.0280	0.057	0.085	0.142	0.198
4 1/2	0.6375	0.0320	0.064	0.096	0.159	0.223
5	0.7083	0.0350	0.071	0.106	0.177	0.248
5 1/2	0.7791	0.0390	0.078	0.117	0.195	0.273
6	0.8500	0.0430	0.085	0.128	0.213	0.297
7	0.9916	0.0500	0.099	0.149	0.248	0.347
8	1.1330	0.0570	0.113	0.170	0.283	0.397

SHOPS purchasing quantity lots of rolled steel flats will find the accompanying table useful in determining the cost of the orders. For example, take the following bill of material ordered in a die shop:

Quantity	Material	Size, In.
1	Boiler plate	2×22×36
2	Oil-hardening steel	1½×3×7½
1	Cold-rolled steel	1×2×72
1	Cobalt-chrome steel	2×3×3
2	Water-hardening steel	2×4×6½

The cost of this order, using the table, is found as follows: Boiler plate is worth 5¢ per lb. From the table, a piece 2×10 in. costs $0.283 per in., while a piece 2×12 in. costs

5/8	WGT.	5c	10c	15c	25c	35c
5/8	0.1110	0.0060	0.011	0.018	0.030	0.042
3/4	0.1328	0.0070	0.013	0.020	0.033	0.046
1	0.1771	0.0090	0.018	0.027	0.044	0.062
1 1/4	0.2213	0.0110	0.022	0.033	0.055	0.077
1 1/2	0.2656	0.0130	0.027	0.040	0.066	0.093
2	0.3541	0.0180	0.035	0.053	0.089	0.124
2 1/2	0.4427	0.0220	0.044	0.066	0.111	0.155
3	0.5312	0.0260	0.053	0.079	0.133	0.186
3 1/2	0.6197	0.0310	0.062	0.093	0.155	0.217
4	0.7083	0.0350	0.071	0.106	0.177	0.248
4 1/2	0.7968	0.0400	0.080	0.120	0.199	0.279
5	0.8854	0.0440	0.089	0.133	0.221	0.310
5 1/2	0.9739	0.0480	0.097	0.146	0.243	0.341
6	1.0620	0.0530	0.106	0.159	0.265	0.372
7	1.2390	0.0620	0.124	0.186	0.310	0.434
8	1.4160	0.0710	0.142	0.212	0.354	0.496

3/4	WGT.	5c	10c	15c	25c	35c
3/4	0.1594	0.0079	0.016	0.024	0.040	0.056
1	0.2125	0.0110	0.021	0.032	0.053	0.074
1 1/4	0.2656	0.0130	0.027	0.040	0.066	0.093
1 1/2	0.3187	0.0160	0.032	0.048	0.079	0.112
2	0.4250	0.0210	0.043	0.064	0.106	0.149
2 1/2	0.5312	0.0260	0.053	0.079	0.133	0.186
3	0.6375	0.0320	0.064	0.096	0.159	0.223
3 1/2	0.7437	0.0370	0.074	0.112	0.186	0.260
4	0.8499	0.0420	0.085	0.127	0.212	0.297
4 1/2	0.9562	0.0480	0.096	0.143	0.239	0.334
5	1.0620	0.0530	0.106	0.159	0.265	0.372
5 1/2	1.1680	0.0580	0.117	0.175	0.292	0.409
6	1.2750	0.0640	0.127	0.191	0.319	0.446
7	1.4870	0.0740	0.149	0.223	0.372	0.520
8	1.6990	0.0850	0.170	0.255	0.425	0.595
9	1.9120	0.0960	0.191	0.287	0.478	0.669

1	WGT.	5c	10c	15c	25c	35c
1	0.2833	0.014	0.028	0.042	0.071	0.099
1 1/4	0.3541	0.018	0.035	0.053	0.086	0.124
1 1/2	0.4249	0.021	0.042	0.064	0.106	0.149
2	0.5666	0.028	0.057	0.085	0.142	0.198
2 1/2	0.7083	0.035	0.071	0.106	0.177	0.248
3	0.8499	0.042	0.085	0.127	0.212	0.297
3 1/2	0.9916	0.049	0.099	0.149	0.248	0.347
4	1.1330	0.056	0.113	0.170	0.283	0.396
4 1/2	1.2750	0.064	0.127	0.191	0.319	0.446
5	1.4160	0.071	0.142	0.212	0.354	0.496
5 1/2	1.5580	0.078	0.156	0.234	0.389	0.545
6	1.7000	0.085	0.170	0.255	0.425	0.595
7	1.9830	0.099	0.198	0.297	0.496	0.694
8	2.2660	0.113	0.227	0.340	0.566	0.793
9	2.5500	0.127	0.255	0.382	0.637	0.892
10	2.8330	0.142	0.283	0.425	0.708	0.991

Weight and Cost of Rolled Steel Flats

$0.034 per in.; therefore, a piece 2×22 in. costs $0.283 + $0.34 = $0.623 per in. Hence, the cost for the 2×22×36-in. boiler plate is 36 × $0.623 = $22.428, or $22.43.

Oil-hardening steel costs 35¢ per lb. From the table, a piece 1½×3 in. costs $0.446. Therefore, the cost for two pieces each 7½ in. long costs 2 × 7½ × $0.446 = $6.69.

Similarly, cold-rolled steel, at 10¢ per lb., costs $4.00.

Cobalt-Chrome steel costs 85¢ per lb. Since the table gives costs only up to 35¢ per in., the cost per inch of this steel must be obtained by observing from the table that a 2×3-in. piece at 35¢ per lb. costs $0.595 per in., or at 70¢ per lb. It costs 2 × $0.595 = $1.19 per in.; also, a 2×3-in. piece at 15¢ per lb. costs $0.255 per in. Therefore, the cost of a 2×3-in. piece at 85¢ per lb. is $0.595 + $0.255 = $1.445 per in. Hence, the price of the 2×3×3-in. Cobalt-Chrome steel is 3 × $1.445 = $4.335, or $4.36.

The water-hardening steel at 15¢ per lb. costs $4.42.

Hence, the total cost of the material is $41.87.

Special columns can be added to the table should any one shop be purchasing steel at odd prices, say 23¢ per lb.

WEIGHT AND COST PER INCH

1¼	WGT.	5c	10c	15c	25c	35c
1¼	0.4427	0.022	0.044	0.066	0.111	0.155
1½	0.5312	0.026	0.053	0.079	0.133	0.186
2	0.7083	0.035	0.071	0.106	0.177	0.248
2½	0.8854	0.044	0.088	0.133	0.221	0.310
3	1.0620	0.053	0.106	0.159	0.265	0.372
3½	1.2390	0.062	0.124	0.186	0.310	0.434
4	1.4160	0.071	0.142	0.212	0.354	0.496
4½	1.5940	0.080	0.159	0.239	0.398	0.558
5	1.7710	0.088	0.177	0.266	0.443	0.620
5½	1.9480	0.097	0.195	0.292	0.487	0.682
6	2.1250	0.106	0.212	0.319	0.531	0.744
7	2.4790	0.124	0.248	0.372	0.620	0.868
8	2.8330	0.142	0.283	0.425	0.708	0.991
9	3.1870	0.159	0.319	0.478	0.797	1.115
10	3.5410	0.177	0.354	0.531	0.885	1.240
12	4.2500	0.212	0.425	0.637	1.062	1.487

1½	WGT.	5c	10c	15c	25c	35c
1½	0.6375	0.032	0.064	0.096	0.159	0.223
2	0.8500	0.042	0.085	0.127	0.212	0.297
2½	1.0620	0.053	0.106	0.159	0.265	0.372
3	1.2750	0.064	0.127	0.191	0.319	0.446
3½	1.4870	0.074	0.149	0.223	0.372	0.520
4	1.7000	0.085	0.170	0.255	0.425	0.595
4½	1.9120	0.096	0.191	0.287	0.478	0.669
5	2.1250	0.106	0.212	0.319	0.531	0.744
5½	2.3370	0.117	0.234	0.350	0.584	0.818
6	2.5500	0.127	0.255	0.382	0.637	0.892
7	2.9750	0.149	0.297	0.446	0.744	1.041
8	3.4000	0.170	0.340	0.510	0.850	1.190
9	3.8250	0.191	0.382	0.574	0.956	1.339
10	4.2500	0.212	0.425	0.637	1.062	1.487
12	5.1000	0.255	0.510	0.765	1.275	1.785

1¾	WGT.	5c	10c	15c	25c	35c
1¾	0.8675	0.043	0.087	0.130	0.216	0.304
2	0.9916	0.049	0.099	0.149	0.248	0.347
2½	1.2400	0.062	0.124	0.186	0.310	0.434
3	1.4870	0.074	0.149	0.223	0.372	0.521
3½	1.7360	0.087	0.174	0.260	0.434	0.608
4	1.9830	0.099	0.198	0.297	0.496	0.694
4½	2.2320	0.112	0.223	0.335	0.558	0.781
5	2.4790	0.124	0.248	0.372	0.620	0.868
5½	2.7280	0.136	0.273	0.409	0.682	0.955
6	2.9750	0.149	0.298	0.446	0.744	1.041
7	3.4710	0.174	0.347	0.521	0.868	1.215
8	3.9670	0.198	0.397	0.595	0.992	1.389
9	4.4630	0.223	0.446	0.669	1.116	1.562
10	4.9580	0.248	0.496	0.744	1.240	1.735
12	5.9500	0.298	0.595	0.893	1.488	2.083

2	WGT.	5c	10c	15c	25c	35c
2	1.1330	0.057	0.113	0.170	0.283	0.396
2½	1.4160	0.071	0.142	0.212	0.354	0.496
3	1.7000	0.085	0.170	0.255	0.425	0.595
3½	1.9830	0.099	0.198	0.297	0.496	0.694
4	2.2660	0.113	0.227	0.340	0.566	0.793
4½	2.5500	0.127	0.255	0.382	0.637	0.892
5	2.8330	0.142	0.283	0.425	0.708	0.991
5½	3.1160	0.156	0.312	0.467	0.779	1.091
6	3.4000	0.170	0.340	0.510	0.850	1.190
7	3.9660	0.198	0.397	0.595	0.991	1.388
8	4.5330	0.227	0.453	0.680	1.133	1.586
9	5.1000	0.255	0.510	0.765	1.275	1.785
10	5.6660	0.283	0.567	0.850	1.416	1.983
12	6.8000	0.340	0.680	1.020	1.700	2.380

2¼	WGT.	5c	10c	15c	25c	35c
2¼	1.4350	0.072	0.144	0.216	0.360	0.504
2½	1.5920	0.079	0.159	0.237	0.395	0.553
3	1.9120	0.096	0.191	0.288	0.480	0.672
3½	2.2320	0.112	0.223	0.336	0.560	0.784
4	2.5510	0.128	0.255	0.384	0.640	0.896
4½	2.8670	0.143	0.287	0.429	0.715	1.001
5	3.1840	0.159	0.318	0.477	0.795	1.113
5½	3.5040	0.175	0.350	0.525	0.875	1.225
6	3.8240	0.191	0.382	0.573	0.955	1.337
7	4.4620	0.223	0.446	0.669	1.115	1.561
8	5.0990	0.255	0.510	0.765	1.275	1.785
9	5.7380	0.287	0.574	0.861	1.434	2.008
10	6.3750	0.319	0.638	0.956	1.594	2.231
12	7.6500	0.383	0.765	1.148	1.913	2.678

2½	WGT.	5c	10c	15c	25c	35c
2½	1.7710	0.088	0.177	0.266	0.443	0.620
3	2.1250	0.106	0.212	0.319	0.531	0.744
3½	2.4790	0.124	0.248	0.372	0.620	0.868
4	2.8330	0.142	0.283	0.425	0.708	0.991
4½	3.1870	0.159	0.319	0.478	0.797	1.154
5	3.5410	0.177	0.354	0.531	0.885	1.239
5½	3.8960	0.195	0.390	0.584	0.974	1.364
6	4.2500	0.212	0.425	0.637	1.062	1.487
7	4.9580	0.248	0.496	0.744	1.239	1.735
8	5.6660	0.283	0.567	0.850	1.416	1.983
9	6.3750	0.319	0.637	0.956	1.594	2.231
10	7.0830	0.354	0.708	1.062	1.771	2.479
12	8.5000	0.425	0.850	1.275	2.125	2.975

3	WGT.	5c	10c	15c	25c	35c
3	2.5500	0.127	0.255	0.382	0.637	0.892
3½	2.9750	0.149	0.297	0.446	0.744	1.041
4	3.4000	0.170	0.340	0.510	0.850	1.190
4½	3.8250	0.191	0.382	0.574	0.956	1.339
5	4.2500	0.212	0.425	0.637	1.062	1.487
5½	4.6750	0.234	0.467	0.701	1.169	1.636
6	5.1000	0.255	0.510	0.765	1.275	1.785
7	5.9500	0.297	0.595	0.892	1.487	2.082
8	6.8000	0.340	0.680	1.020	1.700	2.380
9	7.6500	0.382	0.765	1.147	1.912	2.677
10	8.5000	0.425	0.850	1.275	2.125	2.975
12	10.2000	0.510	1.020	1.530	2.550	3.570

4	WGT.	5c	10c	15c	25c	35c
4	4.5330	0.227	0.453	0.680	1.133	1.587
4½	5.1000	0.255	0.510	0.765	1.275	1.785
5	5.6670	0.283	0.567	0.850	1.417	1.983
5½	6.2330	0.312	0.623	0.935	1.558	2.182
6	6.8000	0.340	0.680	1.020	1.700	2.380
7	7.9330	0.397	0.793	1.190	1.983	2.776
8	9.0670	0.453	0.907	1.360	2.267	3.173
9	10.2000	0.510	1.020	1.530	2.550	3.570
10	11.3330	0.567	1.133	1.700	2.833	3.967
12	13.6000	0.680	1.360	2.040	3.400	4.760

"Of Thee I Sing"

HAVE YOU heard "The Pursuit of Happiness" program over the Columbia network? Did you see the play "The American Way" when it was on Broadway recently?

Each represents a commendable attempt to dramatize to the people the desirability of the democratic way of life. Each strikes a responsive note in us as the advocates of various "isms" sound off discordantly in our midst.

Yet such programs and plays, even if multiplied a thousand times, will not wholly attain their objective unless democracy really works for all the people. Obviously, that objective is beyond reach so long as this country has nine to ten millions of unemployed.

Many Americans profess alarm, and rightly so, that fascism, communism, socialism and other isms have secured a hold on so many millions throughout the world. They fear that before the waves of these new political theories spend their force, the United States may be engulfed.

"Why," they ask, "should we have to choose between some form of fascism and communism? Isn't the democratic system better than either of these?"

Of course it is better. But that flat statement is based on the assumption that the democratic system works to the benefit of all.

The surest way to preserve the democratic system is to see that just as many people as possible have a definite stake in it. The man who has a good job with reasonable security and permanence of income, who can feed and clothe his family and give them more than mere subsistence, has a stake in democracy and will fight for it.

But how about the millions without that security or without any material possessions? How about the young people who find it difficult or impossible to get a foothold in our economic system? They might conceivably ask, "What has democracy done for us?" And many of them are asking it. If a fake economic doctor selling nostrums came along, would they trade their democratic rights for a greater measure of security? Millions have done that in other parts of the world. One of our eminent citizens who has traveled and lived abroad keeps asking himself, "Why have they done it?"

There is one way to shut the door on that possibility. It is for us to put the same fervor, thought and earnestness into making our economic system work as did our forebears in making the representative form of government work through universal suffrage. Our purpose must be to give every man the feeling that he has a stake in our democracy. He can feel that way only if he has employment, if he can live and support his family as a free man among free men.

More essential than anything else then is stability of employment, the opportunity to work the year round, and an income commensurate with the work done.

American industry can do no greater service to itself and to the nation than to strive to achieve that goal by collective effort. Isolated and praiseworthy attempts have been made by individual companies to move toward that goal; but success on a national scale cannot be attained unless a mass attack is staged.

More jobs, steadier employment, higher annual wages, more money to spend for food, clothing, shelter and the good things of life. When American industry can provide these things, and obviously they cannot be provided without the sincere cooperation of government, we won't have to worry about the ability of our democracy to endure. Then we can lustily voice our sentiments to the strains of "Of Thee I Sing" without anxiety.

It is easy to sit in an editorial office, survey the situation and make such observations. Solving the problem is another matter, and a tremendous task. But this country has faced tremendous tasks before. Each emergency brought forth leaders in thought and action. Our faith in democracy is so great that we believe that this challenge too will be met.

Burnham Finney

GAGING BUSINESS

Huge backlog of orders makes production the metal-working industry's chief worry. Only slight plant expansion activity is noticeable in the machine tool industry.

Flush with orders, both domestic and foreign, the metal-working industry's chief worry today is production and not sales. Already booked ahead many months, and in some instances a year or longer, new sales are still impressively large and give promise of a further widening of activities.

MACHINE TOOLS—Principal task of machine tool builders is figuring out ways and means of squeezing out larger production. A few plant additions have been erected, but the industry mostly is relying on increasing output by farming out the manufacture of complete machines as well as of parts and sub-assemblies and by installing more machinery bought several months ago. Companies are running at least two shifts and in many cases three shifts, but are having no luck yet in making a dent in huge backlogs. Long deliveries are interfering with new sales. Many buyers, both domestic and foreign, are reluctant to place orders when they cannot get the machines for seven to ten months. Some companies are sold out until next October. French buying has been unusually heavy. A growing reluctance to take business from Soviet Russia is noted. Though export commitments have been important, U. S. customers have bought machine tools in large numbers. That has been especially true of aircraft makers and of the Army and Navy for arsenals and navy yards. Ford has been an active purchaser of equipment the last few weeks. Japan is buying up used machine tools at a high rate and expects to ship them out of the country before the present trade treaty expires next month.

STEEL—Most mills are about sold to full capacity on flat-rolled steel for the first quarter, but still have available considerable tonnage in heavy products, particularly structural items. Announcement of unchanged prices next quarter failed to bring any relaxation in pressure for rush deliveries. Meanwhile mill operations continue above 90 per cent.

RAILROAD EQUIPMENT—Chicago & Northwestern is spending $100,000 for improvements to locomotive shops, has called more men back to work for repairs on cars and locomotives. Baldwin has made an initial investment of over $2,000,000 to build 28 diesel electric switching locomotives of 1,000- and 600-hp. Electro-Motive Corp. and the Baltimore & Ohio are testing a new 2,700-hp. diesel electric locomotive for heavy freight service. Railroad car building operations are expanding as companies get into production on recent orders. Car orders lately, however, have fallen precipitately from the peak of a month or two ago.

ROAD MACHINERY—Manufacturers are busy preparing new equipment for the Road Show to be held in Chicago late in January. Several new tractors as well as new shovels and grading machinery are being developed.

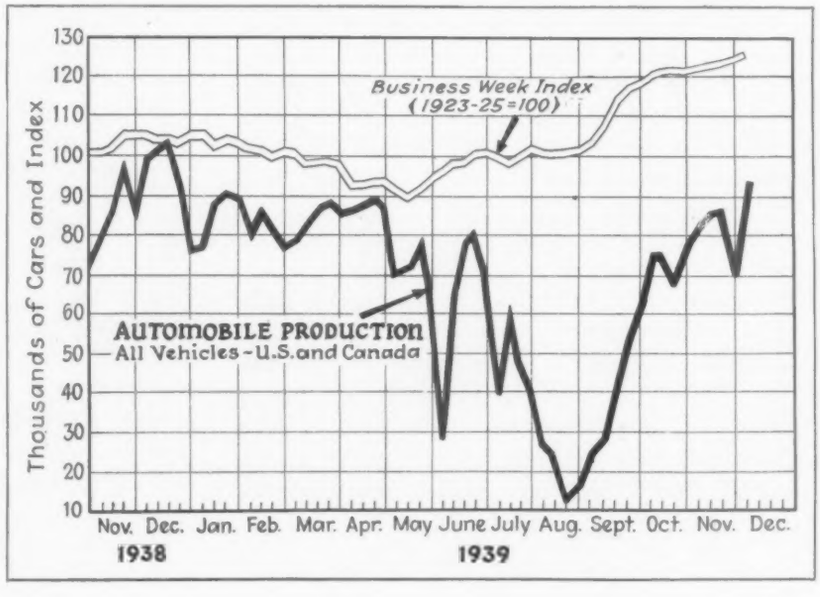
FARM EQUIPMENT—Continued good purchases of alloy steels indicate that farm equipment and tractor makers anticipate brisk operations the next few months. The war has not seriously affected export trade one way or another.

AIRCRAFT—Airplane makers will do a total business of about $300,000,000 this year. With jammed order-books, they are expanding activities as fast as possible and by next spring will have around 80,000 men on their payrolls. Production is changing so fast from day to day that no one in the industry can make even a reasonable accurate guess about the number of planes now being turned out. The limiting production factor today is not so much manpower, though there are shortages of skilled men here and there, but a shortage of certain types of engines and subassemblies.

SHIPBUILDING—Work for the Navy and for the Maritime Commission is keeping private shipyards and navy yards fully engaged. There is scarcely a ship way in the country today which is not occupied. The Navy now has over 100 ships being constructed and the Maritime Commission has 141 cargo ships being built or under contract. Yards devoted chiefly to repair and overhaul of ships are rushed, and at least one company is considering sizable expenditures for rehabilitation of plant equipment.

AUTOMOBILE PRODUCTION VS. GENERAL BUSINESS

Settlement of the Chrysler strike results in jump in automobile production, which gives promise of exceeding last year's figures by a considerable margin



NEWS OF THE INDUSTRY

CANADIAN INDUSTRIALISTS IRKED AT DELAYS IN PLACING ORDERS

TORONTO—Canada is still slow in getting under way its manufacture of war products. Industrialists who had expected large orders before now have been disappointed, and prospects are not too bright for sizable contracts to be placed in the immediate future.

Slowness of Canadian industry in getting mobilized isn't the only reason for the relative inactivity. More to the point is the fact that England has been turning out large quantities of munitions for the past year or longer and today is piling up most of this material. The need for speed in Canada isn't so pressing as anticipated.

Want Immediate Orders

Canadian manufacturers, on the other hand, don't seem pleased at the delays in securing even educational orders from the British. They feel that orders which will familiarize them with the procedure of manufacturing munitions items should be placed immediately and that Britain would do well to start without delay the setting up of so-called "shadow plants" in Canada.

Canadian Associated Aircraft, Ltd., is reported in line for additional orders from the British. It also is possible that orders will be placed with companies outside of the Associated group. National Steel Car Co. is building two complete airplanes per week for the Canadian government.

TRANSPORTATION EQUIPMENT PROMINENT IN GOV'T AWARDS

WASHINGTON—Fargo Motor Corp., Division of Chrysler Corp., Detroit, has been awarded motor trucks by the U. S. Army totaling $8,097,345. Yellow Truck & Coach Mfg. Co., Division of General Motors, has received an army truck order for $3,058,265. Chevrolet has been awarded trucks and ambulances at a cost of $549,213.

Bendix Aviation Corp. will produce starter assemblies for the Army Air Corps at cost of $191,836 at its Eclipse Aviation Division—at Bendix, N. J. Aero Spark Plug Co., Inc., New York City, has been awarded a navy contract totaling $117,448. The S. Morgan Smith Co., York, Pa., will supply hydraulic turbines to the Interior Department at cost of $753,463. Ingersoll-Rand Co., Inc., will provide machinery for the Panama Canal totaling $213,512.

Industrial Machinery Exports Up in October But Do Not Yet Reflect Gains Caused by War

U. S. Machine Builders Expected to Score Increases in South American Market

WASHINGTON—Exports of industrial machinery in October totaled $23,941,763, a gain of 15 per cent over the same month of 1937 and about $700,000 more than in September of this year. Increases were of a general nature and were not caused by the war, as war orders placed in this country since September 2 have not yet been reflected in actual shipping figures.

Shipments of power-driven metalworking machinery were up 21 per cent from October of last year, thanks to machine tools, the total being $9,121,340 as against $7,513,557 last year.

Much hope is put by U. S. industry on gains in Latin-American orders for industrial machinery. Before the war started, according to one expert, exports to countries south of the United States were about $85,000,000 a year. Germany exported $35,000,000 and the Allies $20,000,000.

FRENCH, BRITISH COORDINATE BUYING

NEW YORK—Coordination of activities of the British and French buying missions in the United States has been worked out. The French moved last week from the French Line executive offices in Rockefeller Center to permanent offices at 15 Broad Street. M. Jean Frederick Bloch-Laine, ranking member of the mission, is in charge. The British will continue to function at the offices of the British Consulate General at 25 Broadway with Arthur B. Purvis in command. A number of experts will be added to the British buying staff the next few weeks, coming here from Canada and Britain.

British Combine

Next?—*Sweden, too, intends to be ready if war should strike. Here anti-aircraft guns are undergoing final assembly in one of her munitions plants*

Double Duty—*Specially designed cabinets used by Monarch Machine Tool Company serve as both delivery trucks and storage units. Loaded with parts in the stock room, they are wheeled into position alongside individual workmen, thus increasing the efficiency of men working on small-lot subassembly lines. Parts are not removed until needed, thus eliminating much lost motion*

ALLIES MUNITIONS ORDERS SPOTTY

NEW YORK—The British are known to have given an order for shells to a Toledo, Ohio, company on the basis of 6,000 a day for an indefinite period. An eastern steel company has an order for a limited quantity of shell forgings and may secure a much larger supplemental order soon. On the whole, however, munitions business from the Allies is skimpy and promises to continue that way so long as the war on the western front involves so little actual fighting.

MOVES TO FILL ORDER

CHICAGO—Guiberson Corp. is moving from Dallas, Tex., to Harvey, Ill., to fill a $600,000 order for engines for combat cars and army tanks. Order will be handled in cooperation with Buda, and is expected to provide work for 2,500. About twenty engineers are being transferred from Dallas.

JAPANESE SCOURING COUNTRY FOR USED TOOLS, MACHINERY

NEW YORK—Machine tool purchases by the French mission have been unusually heavy lately, with emphasis placed on deliveries as early as possible. No accurate information is yet available to indicate the exact extent of these purchases as of the present moment.

The Japanese are reported to have been scouring the country for good used machinery, particularly of the heavier types, with the object of shipping this equipment out of the United States before the present trade treaty expires January 26.

Many equipment builders are showing reluctance to take business from Soviet Russia. With order books clogged, they feel that they should give preference anyway to domestic customers and to other foreign buyers.

British buying of machine tools has not been large lately. The British are in a much better position than the French so far as their factory equipment at home is concerned.

CELEBRATES 55th ANNIVERSARY

CINCINNATI — Cincinnati Milling Machine Co. has issued a 64-page book in celebration of the 55th anniversary of the firm's founding. Profusely illustrated, it describes in considerable detail the company's early days and its steady growth to its present position in the machine tool industry. Much space is devoted to the company's various employee welfare activities.

U. S. Government Contracts Awarded to Metal-Working Firms

Machine Tool Contracts on Page 1048f

Contractor	Gov't Agency	Commodity	Amount
General Electric Co., Schenectady, N. Y.	Interior, TVA, Ordnance, Navy	Electrical equipment	$597,877
Air Communications, Inc., Kansas City, Mo.	Signal Corps	Radio Receivers	50,681
Atlas Car & Mfg. Co., Cleveland, Ohio	Navy	Locomotives	58,460
Pressed Steel Tank Co., West Allis, Wis.	Navy	Blank shells	34,374
Lukenweld, Inc., Coatesville, Pa.	Navy	Slides	44,856
Revere Copper & Brass, Inc., Baltimore, Md.	Ordnance	Cartridge cups	142,900
Orton Crane & Shovel Co., Chicago, Ill.	Navy	Cranes	194,227
R. W. Kaltenbach Corp., Bedford, Ohio	Navy	Crane	123,550
Harnischfeger Corp., Milwaukee, Wis.	Navy	Cranes	329,790
John Van Range Co., Cincinnati, Ohio	Navy	Bakery equipment	37,143
C. H. Wheeler Mfg. Co., Philadelphia, Pa.	Navy	Condensers	30,150
Cleveland Crane & Engineering Co., Wickliffe, Ohio	Navy	Cranes	46,465
Read Machinery Co., York, Pa.	Ordnance	Mortar, mounts	187,830
York Ice Machinery Corp., York, Pa.	Air Corps	Refrigerating system	189,294
Cooper-Bessemer Corp., Mt. Vernon, Ohio	Navy	Air compressor	241,699
Cory & Joslin, Inc., San Francisco, Calif.	Navy	Steam plant	196,500
Worthington Pump & Machinery Corp., Harrison, N. J.	Navy	Turbo-generator	265,333
J. H. Bunnell, Inc., Brooklyn, N. Y.	Signal Corps	Radios	57,652
Simplex Wire & Cable Co., Cambridge, Mass.	Signal Corps	Cable	119,960
General Cable Corp., Perth Amboy, N. J.	Signal Corps, TVA	Cable	194,111
Connecticut Tel. & Elec. Corp., Meriden, Conn.	Signal Corps	Telephones	526,365
Eicor, Inc., Chicago, Ill.	Signal Corps	Dynamotor	57,582
Habirshaw Cable & Wire Div., Phelps Dodge Copper Corp., New York, N. Y.	Navy	Cable	48,279
Collyer Insulated Wire Co., Pawtucket, R. I.	Navy	Cable	50,330
National Electric Products Corp., Economy, Pa.	Navy	Cable	22,151
Okonite Co., Passaic, N. J.	Navy, Signal Corps	Cable	207,140
Rockbestos Products Corp., New Haven, Conn.	Navy	Cable	22,614
Anaconda Wire & Cable Co., Hastings-on-Hudson, N. Y.	Navy	Cable	26,489
Eclipse Aviation Div., Bendix Aviation Corp., Bendix, N. J.	Navy	Starters	26,724
Electric Wheel Co., Quincy, Ill.	Ordnance	Bomb trailers	137,951
Spencer Lens Co., Buffalo, N. Y.	Ordnance	Optical instruments	186,893
Bethlehem Steel Co., Bethlehem, Pa.	Ordnance	Bombs	2,545,095
Aluminum Cooking Utensil Co., New Kensington, Pa.	Navy	Cooking utensils	45,722
Walter Kidde & Co., New York, N. Y.	Navy	Fire extinguishers	42,752
Aluminum Products Co., La Grange, Ill.	Navy	Cooking utensils	43,286
International Silver Co., New York, N. Y.	Navy	Silverware	54,540
Federal Screw Works, Chelsea, Mich.	Ordnance	Adapters	32,800
American MonoRail Co., Philadelphia, Pa.	Navy	Cranes, hoists	23,975
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.	Panama Canal, TVA Navy	Electrical equipment	249,837
American Steel & Wire Co., Worcester, Mass.	Air Corps	Cable	103,958
Wright Aeronautical Corp., Paterson, N. J.	Ordnance	Engines	839,675
American Car & Foundry Co., New York, N. Y.	Ordnance	Light tanks	6,055,251
Pioneer Instrument Div., Bendix Aviation Corp., Bendix, N. J.	Navy	Aircraft instruments	47,800
S. Blickman, Inc., Weehauken, N. J.	War, Navy	Surgical, kitchen, apparatus	184,568

Those at the Machine Shop Practice Division meeting included, from left, Sol Einstein, vice-president Cincinnati Milling Machine Co., Fred Colvin, editor emeritus AMERICAN MACHINIST, *and J. B. Armitage, engineering director Kearney & Trecker Corp. After the meeting, Prof. O. W. Boston, University of Michigan; R. T. Wise, consulting engineer Union Twist Drill Co.; Ralph E. Flanders, president Jones & Lamson Machine Co.; and M. F. Judkins, chief engineer Firthite Division of Firth-Sterling Steel Co., talked things over*

Discussions of Many Production Problems Highlight 60th Annual Meeting of A.S.M.E.

PHILADELPHIA — For the first time in 52 years the American Society of Mechanical Engineers held its annual meeting outside New York City. More than 3,000 industrialists, scientists and engineers met at the sixtieth annual session at the Bellevue-Stratford in Philadelphia December 4-8. Over 100 papers were reviewed and discussed at 34 technical sessions. Outstanding among the papers were those devoted to management, marketing, industrial machine tool design and operation, training of skilled workers, and development of cooperative industrial relations.

Thomas Barish, assistant chief engineer Marlin-Rockwell Corp., described a new method of machine tool spindle analysis

Lieutenant Colonel Victor W. Page, U. S. Air Corps Reserve, presented the National Youth Administration's plans to institute a nation-wide program to train 100,000 airplane mechanics to supplement the airplane training now being sponsored by the government in colleges and universities. There are to be established 150 resident airplane mechanic training centers each accommodating from 150 to 1,000 students. Similar in organization to CCC camps, men between 16 and 24 will receive intensive training for six-month periods. The army and navy will furnish supplies but all instructors will be civilians. The work is directed toward supplying ground workers and mechanics in ratio of five to one for the 20,000 civilian pilots now being schooled annually under the Civil Aeronautics Authority in schools of the country.

Personnel Problems Presented

Elmer E. Neff, Brown & Sharpe Mfg. Co., outlined the advantages of apprentice training, stressing the need for giving young men an opportunity to learn trades and for business to avoid a recurrence of a shortage of skilled labor because of the "let George do it" attitude of business management in regard to training mechanics. There was an inclination on the part of the Committee on Education and Training to institute ways and means for promoting and intensifying apprentice training in the metals trade industry, especially in small plants.

Dr. Ross A. McFarland of Harvard University presented studies to support the conclusion that U. S. Industry has been guilty of immeasurable corporate and human waste by shelving older skilled workers. His results of fatigue tests made with the cooperation of elderly workers and youths in fine physical condition refuted the ill-drawn conclusion that fatigue is a controlling factor in eliminating older workers on strenuous jobs, especially when they have been conditioned physically and nervously by long training for steady strains.

W. H. McBryde, left, inducted as A.S.M.E. president at the society's annual dinner Dec. 6, congratulates retiring president A. G. Christie on a successful year, as secretary C. E. Davies, center looks on

Better business conditions have opened up a need for evaluating the part mechanical engineering plays in the general economic trend, according to J. R. Bangs, professor of administrative engineering at Cornell University. He stated that modernization of designs, mechanical improvements, production schedules, cooperation between sales departments, and labor relations are a few of the factors which today must be considered by mechanical engineers.

By the simple expedient of relieving workers' hands for production labor through installing foot levers, by judicial location of machine controls, by proper location of machines, and by eliminating obstacles at machines and shop equipment, production often can be increased up to 60 per cent on single jobs, declared O. W. Habel, factory manager, Saginaw Steering Gear Division of General Motors. Desirable and undesir-

A. M. Johnson, president Barnes Drill Co., discussed machine design and motion economy before the Machine Shop Practice Division

able methods of machine tool operation were illustrated by a technicolor motion picture; this was without question one of the high lights of the machine shop practice sessions.

Spindle bearings and their relations to close tolerance work featured the paper by Thomas Barish, Chief Engineer, Marlin-Rockwell Corp. He presented a method for calculating deflection in machine tool spindles to evaluate the proper length of the spindle.

Many phases of machine design were discussed. Dr. M. Hetenyi, Westinghouse Research Laboratories, revealed the latest advances in methods for determining stresses in machine parts by photographing plastic models of parts with polarized light. His method permits the exact location of stresses in metal parts, including rotating shafts of great weight running at speeds as high as 3600 r.p.m. Its importance to engineers is its accuracy in locating locii of stresses and strains in machine parts actually in operation.

O. W. Habel, factory manager Saginaw Steering Gear Division of General Motors Corp., presented a paper before the Machine Shop Practice Division outlining machine design and motion study

Hint Gigantic Plane Engine

Guarded references were made during the annual meeting by Dr. Alexander Klemin, Guggenheim School of Aeronautics, New York University, to 42-cylinder airplane motor now being developed in the United States which will be capable of driving a pursuit ship at least 400 m.p.h. Its development is paralleled by the successful construction of 500-m.p.h. wing, according to Dr. Klemin. This engine will be powerful enough to lift a plane at the steepest flying angle yet attained in aviation.

The Annual A.S.M.E. Dinner and Honors Night was held Wednesday December 6. The John Frizt Medal Award, highest engineering award and previously conferred upon such outstanding engineers as Edison, Marconi and Hoover, was presented posthumously to Dr. Clarence Floyd Hirshfield internationally known power engineer and educator who died in March, 1939. The Melville Medal was awarded to Lester M. Goldsmith of the Atlantic Refining Company. Dr. Rupen Eksergian, Consulting Engineer of the Edward G. Budd Company, was the recipient of the Worcester Reed Warner medal for his outstanding contributions to engineering literature.

At the annual dinner Warren H. McBryde, Consulting Engineer of San Francisco, was inducted as president of the A.S.M.E. for 1940.

R. L. Kent, William Sellers & Co., attended the industrial marketing meeting of the Management Division

U. S. Government Contracts Awarded to Machine Tool Makers

(Other Metal-Working Contracts on Page 1048d)

Contractor	Gov't Agency	Commodity	Amount
Rockford Machine Tool Co., Rockford, Ill.	Navy	Planer	$23,643
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.	Navy	Milling and drilling machine	30,258
Consolidated Machine Tool Corp., Rochester, N. Y.	Navy	Planing and scarfing machine	43,460
Jones & Lamson Machine Co., Springfield, Vt.	Ordnance	Spindle machines	15,397
Minster Machine Co., Minster, Ohio	Ordnance	Inclinable presses	12,978
Kearney & Trecker Corp., Milwaukee, Wis.	Ordnance	Milling machines	34,724
Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.	Navy	Heading press	51,929
American Tool Works Co., Cincinnati, Ohio.	Ordnance	Drilling and tapping machine	34,381
Chambersburg Engineering Co., Chambersburg, Pa.	Ordnance	Drop hammer	14,080
Erie Foundry Co., Erie, Pa.	Ordnance	Drop hammer	33,470
Colonial Broach Co., Detroit, Mich.	Ordnance	Broaching machines	35,665
Hanson-Whitney Machine Co., Hartford, Conn.	Ordnance	Milling machine	26,176
Mattison Machine Works, Rockford, Ill.	Ordnance	Surface grinders	14,584
Pratt & Whitney Div., Niles-Bemet-Pond Co., Hartford, Conn.	Ordnance	Precision lathes, profilers	76,238
Monarch Machine Tool Co., Sidney, Ohio	Ordnance	Lathes	77,668
G. A. Gray Co., Cincinnati, Ohio	Navy	Planer	105,638
Brown & Sharpe Mfg. Co., Providence, R. I.	Air Corps, Ordnance	Grinders, milling machines	106,082
Covel Mfg. Co., Benton Harbor, Mich.	Air Corps	Grinder	13,560
Gisholt Machine Co., Madison, Wis.	Navy	Turret lathes	24,190
Chicago Pneumatic Tool Co., Detroit, Mich.	Air Corps	Pneumatic tools	46,324
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.	Ordnance	Charging machines	32,600
Kingsbury Machine Tool Corp., Keene, N. H.	Ordnance	Drilling machine	12,133
Universal Boring Machine Co., Hudson, Mass.	Ordnance	Boring mills	142,055
Woodward Governor Co., Rockford, Ill.	Interior	Governors	56,040
General Machinery Corp., Hamilton, Ohio.	Ordnance	Boring lathes	113,990
Vandyke Churchill Co., New York, N. Y.	Ordnance	Honing machine	34,536
E. W. Bliss Co., Brooklyn, N. Y.	War	Dies, tools	12,845
Cincinnati Milling Machine & Cincinnati Grinders, Inc., Cincinnati, Ohio	Ordnance	Milling machines	50,129

INSIDE DETROIT

By Rupert Le Grand
DETROIT EDITOR

Production of 3,500,000 units for 1939 expected as Chrysler resumes operations and orders continue to pour in. Some makers report November as their best month on record

DETROIT—Another "silk shirt" era is in the making, if climbing automobile sales are any criterion. November was the biggest month of the year for several important producers. They foresee the best fourth quarter on record for their particular organizations.

Order backlogs have increased during the month by as much as 20 per cent. Some plants could run full blast for two months with business now on the books. Wages paid to workers in some plants are the best ever for two reasons: the best wage scale in history and overtime pay.

Chrysler Operation Boosts Total

Production during November is estimated at 380,000 units. With Chrysler now forging ahead in all Detroit plants, the industry total should be lifted to about 435,000 units in December. Thus, the total for 1939 should come to approximately 3,500,000 cars and trucks, United States and Canada. Strikes during the year are believed to have cost the industry more than 250,000 units.

There is no indication at present that production will falter during January and possibly in February. Certainly General Motors units such as Chevrolet, Pontiac, Olds and Buick will be compelled to operate at the present rate for many weeks. Chrysler, now aggressively pushing its lines again, should have a strong winter season. Ford sales in the first 20 days of November were up 53 per cent, and the daily production for December was lifted to 5,000 units. The independents also have been straining to get out cars, and in the main have exceeded their original projections of production so far during last quarter.

General Motors Sales Heavy

Specific examples show the strength of public demand for new models. Chevrolet had the best month since August 1937, selling 89,377 cars and trucks during November. This is a gain of 16 per cent over the same month last year. Production during December and January is pointed at 115,000 cars and trucks, domestic and export. Dealers sold 118,252 used vehicles in November, or a gain of 18 per cent over November, 1938. Sales of both new and used vehicles gained at the end of the 30 day period.

Pontiac's new car sales topped 22,000 in November, the best month on record. Used-car sales likewise surpassed previous marks. Dealers have an inventory of only 15,000 vehicles, one-third of which are demonstrators and the rest in transit for delivery, as compared to a normal inventory of 25,000. The factory has a month's backlog of orders.

Buick crashed through with retail sales of 10,385 units in the last ten days of November, swelling the month's total to 29,292. This figure showed a gain of 34 per cent over November a year ago and was 3,384 better than October, 1939. Used-car sales during the month came to 39,239, or in excess of the usual stock.

New Aircraft Carburetor

Entry into the aviation field is expected to stimulate the activities of the Marvel-Schebler Carburetor Div. of Borg-Warner Corp., Flint. The concern has adapted one of its tractor carburetors for use on 90-100 hp. ships, and has been supplying this new model for Franklin air-cooled motors. The shop must provide at least 30 per cent more inspection on the aviation carburetor as compared with its regular line of automotive, tractor, marine and industrial types. One of the features of the new carburetor is a double-float mechanism which provides accurate fuel metering under extreme angles of flight.

BOTH SIDES LOSE

DETROIT—The drubbing which both sides took in the Chrysler strike is likely to act as a brake on further serious automotive labor trouble for a while. The union got back in hourly rate raises only a minor precentage of the wages lost as a result of idleness during the strike. The company, on the other hand, lost sales running into staggering figures, and it will be months before the lost production ground can be recovered. With national CIO leaders like Philip Murray plugging for stability rather than more strikes, General Motors seems safe for the moment. If any trouble occurs, it is more likely to be at plants of small suppliers than at those of the big fellows.

Happy Days—*New Dodges began to roll off the assembly line less than an hour after men reported to work, following settlement of the Chrysler strike. Happy indeed should be the men returning to work. But they lost some $15,000,000 in wages while they were idle. Pay increase granted by the company amounts to only $5,000,000 a year*

WATCHING WASHINGTON

McGraw-Hill Washington Bureau

PAUL WOOTON, CHIEF

Manufacturers installing munitions-making machinery allowed 10 per cent depreciation allowance in figuring costs. Colt's Patent Fire Arms is first concern to be affected.

WASHINGTON — Colt's Patent Fire Arms takes the honor of making the first "closing agreement" with the Treasury under the Vinson-Trammell and National Defense Acts. Thin a lot of college words out of the story and you get this: The Army makes two kinds of contracts—low bid, and negotiated. Army is "negotiating" a deal with Colt's for about $800,000 worth of airplane guns, presumably machine guns. To make this product, Colt's says it will have to buy special jigs, dies, fixtures, gages, which it cannot use on other work. The War Department tells the Treasury that what Colt's says is true. The Treasury then takes account of these costs in limiting the manufacturer to 12 per cent profit under the law. To protect itself in future, however, the government provides in the agreement that if the special tools are eventually used on other than the contract production, a reasonable portion of the cost shall be re-allocated to such other production. As to certain additional standard machinery the company will need to produce the order, the agreement permits it to charge off 10 per cent of cost each year as a depreciation allowance.

Triple for TNEC

TNEC has announced three sets of hearings for December. The first of them, on prices, is under way. Weeks ago, when it looked as if some ambitious people hoped to rocket prices, the Administration brandished its bull whip in their direction—without comment. But Roosevelt told TNEC to maintain "constant surveillance" on price movements. That's what it is doing. Sen. O'Mahony says he will "inform the public of the underlying characteristics of the current situation." Conservative critics say TNEC's price hearing has already blasted the Administration's threat of war profits taxes. Federal procurement itself, including heavy defense buying, is largely responsible for the price boom, they say.

What About Finland?

Now that the neutrality law has been reversed (embargo on arms for belligerents changed to come-and-get-it), Roosevelt is on a spot in the case of Russia vs. Finland, our friend who can't get here to buy. It's the same spot FDR was on in the case of Japan and China under the old law. So his cue is to call for a "moral" arms embargo against Russia for bombing civilians, as he did against Japan for the same offense. Embargo may be called on scrap metal as well as on airplanes and munitions. Flaw in this moral weapon is that Russia buys few planes and little scrap.

Coming: Labor Free-for-All

On the labor law front: House Committee investigating NLRB is far behind schedule and cannot report till late in the coming session of Congress. The presidential election will be coming on; it will look dangerous to aggravate either industry or labor in face of the "war." Observers here add those points to mean that amendment of the act seems unlikely. . . . Attorney General Murphy is reported determined to prosecute labor unions for violation of anti-trust laws. . . . Manufacturers Association will urge next Congress to amend the wage-hour law on several points; the revision drive will be a free-for-all, with labor, agriculture and industry swinging wild. . . . Appointment of Acting Wage-Hour Administrator Harold Jacobs to be Administrator doesn't mean a thing—except his salary will be raised to $10,000. Col. Philip Fleming is the actual crowned head, but many suspect that Secretary Perkins is behind the arras.

Next Time—Not So Easy

Over two billions next year for the war we don't intend to fight will meet opposition far more effective in the next Congress than in the last. The Administration put out a feeler through House Naval Affairs Committee Chairman Vinson proposing a pay-as-you-go plan, with increased income, inheritance, and gift (emergency) taxes. This would put a crimp in opposition to increasing the defense debt. But New and Old Deals are split on the issue, in mortal fear of taxing the body politic in face of the election. Anti-armament people approve. Of course Defense will win big money against all odds, but maybe not two billions plus. Roosevelt will get his $271,000,000 to foot bills for neutrality expansion and expenses as soon as Congress sits down.

Exit Stettinius & Co.

At last President Roosevelt fired the Stettinius boys whom Assistant Secretary of War Louis Johnson manuevered together as a War Resources Board. Ask War Dept. spokesmen to explain the coming and going of the board and they say it's simple: The board did its job and is now excused until further needed. But Roosevelt's invitation to members to continue to serve sounds like "come up and see me some time." Washington Tories say that FDR regretted his appointment of the board immediately after Johnson talked him into it; that he resents the board's pigeon-holing of the Tate report (on defense power hookup); that nothing much will come of the board's report.

Congressional Schedule:

If you can't wait till Congress moves into the Capital's expensive hotels and starts talking from the Hill top, here's what they will dish up to the headline industry: stay out of Europe's war; more recovery for business and more help for the unemployed; economy cramps again—balance the budget; revise the labor laws; more frantic paddling upstream against the farm problem; maybe, but not likely, some new law about steel monopoly; maybe more "solutions" for the railroads; last but not least, big talk and big money on national defense, with cries of pain from peace mongers. More neutrality law if the smoke thickens.

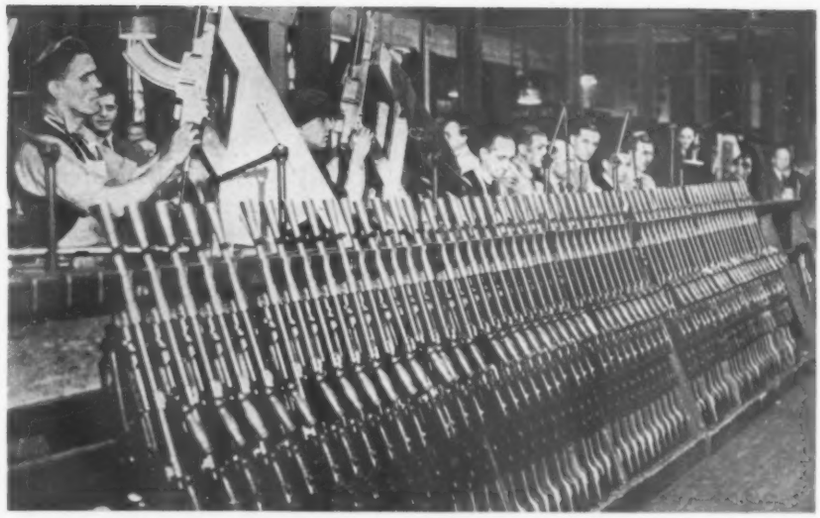
Defense Sidelights

On Oct. 1 Navy had more than 100 ships under construction; Congress is expected to authorize next session huge expansion that will keep draftsmen and builders busy for years. . . . Curbstone mariners of this town say that the British are surveying our whole Atlantic coast for shipping that might be for sale, including the laid-up merchant fleet. . . . FDR's enemies are chuckling about his "neutrality" law which he will have to invoke against Finland—if he "finds" that a state of war exists. . . . Enormous quantities of dental equipment will be bought by the Army, which finds that in the depression American teeth went to ruin. . . . We get mercury from Spain, Italy, Mexico; the Senate Military Affairs Committee has added it to the list of strategic raw materials.

"Somewhere In England"

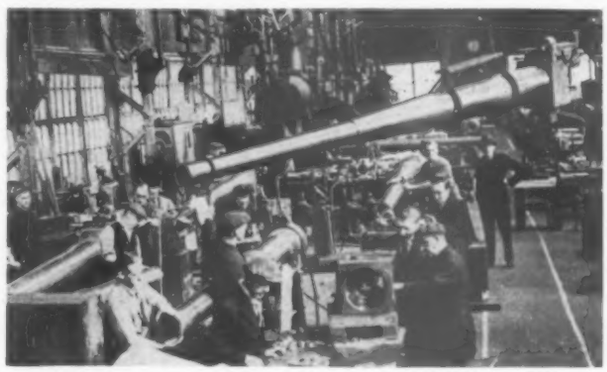
Over three months ago Britain declared war. Only recently had her industry been geared up to carry the tremendous extra load expected.

With war came blocking of all news of England's industrial activity. Then slowly, erratically, stories and pictures began to trickle through. As the war settled down to one of words and worries, Britain released a flood of propaganda to prove her industrial self-sufficiency. Among the pictures passed are these photographs, secured through the British Press Combine. All were taken, according to the captions accompaning them, "somewhere in England."

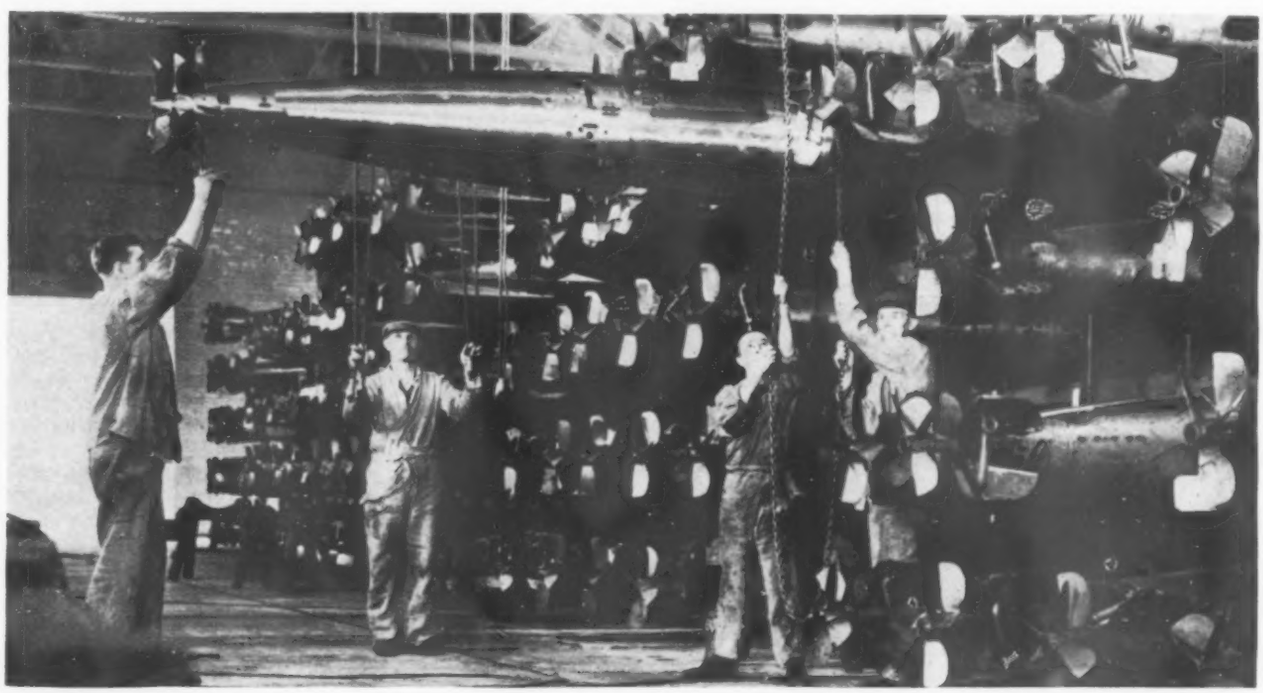


Machine guns *are being turned out in rapidly increasing numbers. Here the famous Bren light automatic is being put together in a small-arms factory*

Aircraft production *includes huge numbers of Miles Master trainers, claimed to be the fastest in the world*



Naval guns *are rushed to completion to help Britain maintain her sea mastery. Here the barrels are finished*



Torpedoes *which have been tested are stored in the government munitions plant to await finishing touches*

Advantages of Private Enterprise Stressed At 44th Congress of American Industry

NEW YORK—Taking as its theme "Forward With the Republic," the National Association of Manufacturers held the forty-fourth Congress of American Industry at the Waldorf-Astoria, Dec. 6-8. The underlying basis of the program was that world conditions have made it increasingly important for the United States to solve its domestic problems and that they cannot be solved without a full understanding of the basic fundamentals of the American system.

As usual, the Congress brought together a brilliant array of speakers from American industry and from public life. Two highspots were the adoption of the Platform of American Industry and the annual dinner at which Senator Burton K. Wheeler and Wendell L. Willkie were the speakers.

Coonley Emphasizes Fundamentals

Howard Coonley, president of the association, demanded that the nation be rededicated to the six "fundamental principles upon which it was founded." These principles are (1) the greatest measure of individual liberty compatible with public interest, (2) functioning of government as a servant rather than a master of the people, (3) government through legislation rather than by executive decree, (4) lifting of intolerable burden of taxes levied in name of social benefits, (5) raising of standard of living by adherence to time-tested system of individual private enterprise and incentive, and (6) keeping intact our national trinity—representative political democracy, religious and social liberties and free enterprise.

The way to strengthen all the things our democracy stands for is to substitute for the murk that goes by the name of propaganda, new propagandas presenting the truth, the whole truth and nothing but the truth, declared Paul Garrett, director of public relations for General Motors Corp. Giving factual proof that war never produces profit, but only losses, Ernest T. Weir, chairman of National Steel Corp., emphasized that "private enterprise knows that only in peace can the United States have genuine prosperity."

Need for Choice Stressed

America soon must choose a free competitive system or a system of government ownership and control, said William L. Batt, president SKF Industries, Inc. Whatever choice is made depends in large measure on what is taking place now and what occur within the relatively near future. "There are four things particularly that no restriction should ever take away from private enterprise," according to Mr. Batt. "It must not eliminate the incentive for a reasonable profit; it must not eliminate competition, except where it can be shown that the net gain to the public will be increased enough to offset any loss inefficiency; it must not be so ambiguous as to confuse those operating under the system; and it must not discriminate between one individual or group and another."

Private enterprise is the sole hope of our national defense in peace or war, and any departure from it will bring disaster, said General Hugh Johnson in an address on "Private Enterprise as the Mainstay of National Defense."

Production in many lines of business currently is running ahead of consumption and as a consequence a decline in business is likely somewhere in the first half of 1940, predicted Dr. Lionel D. Edie, economist.

"MORE GOODS FOR MORE PEOPLE"

In its platform the association pledged itself to the principle of "production and distribution of more goods for more people." It declared in favor of the vital importance of private savings and investment for providing plant equipment and other resources required for new enterprise and additional employment. It favored extension of research to develop new and better products at lower prices and maintenance of wage rates which will promote increased production and employment and a higher income for workers.

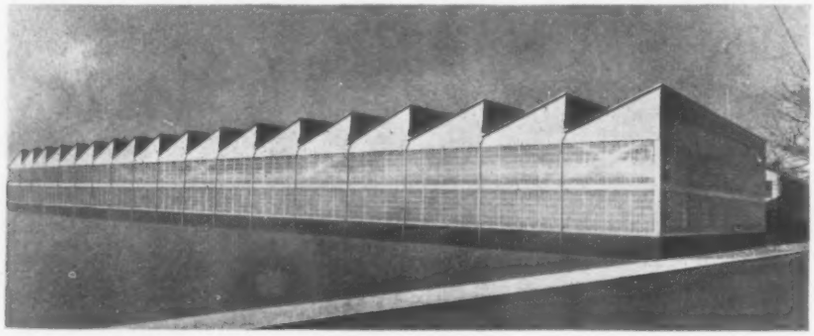
Recognition should be given the right of the employee to join any labor organization, or none at all, as the employee himself may deem best in his own interest, of his own free will and volition, without coercion, duress or intimidation from any source, said the platform. It also advocated the greatest possible regularity of production as a means to continuity of employment. Where such regularity is impractical, continuity of employment should be achieved by a reasonable variation in working hours.

HOUSEWARMING IS HELD BY LANDIS TOOL COMPANY

WAYNESBORO, PA.—The housewarming at the new erection shop of the Landis Tool Co. was celebrated Dec. 2-3 when it was visited by over 10,000 persons. Most visitors were from Waynesboro and neighboring towns, but many others from distant points were present.

The new building will relieve the main shops of all erection work. There are 18 sawtooth skylights in the 120x455 ft. structure which is divided into two bays. Daylight is provided by 17,000 panes of special light-diffusing glass. Mazda and mercury lamps give 42 ft.-candles at working height over the entire building. Floors are wood block at points where men stand at assembling benches; at other points they are concrete. Heat is provided by unit heaters giving 80 deg. at 10 deg. below zero with an 80-mile wind. Overhead lights have safety covers cast under tension so that if they should break they disintegrate into thousands of small pieces and prevent injury to those working below.

Paint spraying is done over a large grating with a down draft which draws all fumes away from the workmen. The solid matter falls into an ever-flowing water supply and is recovered and returned to the paint maker. A large door to admit freight cars is operated electrically in connection with a unit heater. As the door is opened a blast of hot air keeps cold outer air from entering.



Housewarming—*Erection Shop completed by Landis Tool Co. at Waynesboro, Pa., which provides 66,000 sq. ft. additional floor space, was inspected by executives of the metal-working industry at a housewarming Dec. 2nd and 3rd*

PERSONALS

W. A. BARR has been made executive vice-president and general manager of Foote Bros. Gear & Machine Corp., Chicago, Ill. He succeeds W. H. FOWLER, who has resigned as president and general manager. Mr. Fowler will become assistant to the president and chief executive officer of American Machine & Metals, Inc., of Moline, but will remain as director and chairman of the executive committee of Foote Bros.

EDGAR S. BLOOM, president and director of the Western Electric Co. and connected with the organization for the past 43 years, will retire the latter part of December to become Director of Purchases for the British Purchasing Commission, New York, N. Y., according to Arthur B. Purvis, director-general of the commission. Frederick Johnson, since 1935 vice-president of the Bell Telephone Co. of Canada, will serve as Director of Administration of the commission.

H. B. CARPENTER, Cleveland district manager Republic Steel Corp., has been appointed assistant vice-president in charge of operations. He will be succeeded by J. L. HYLAND, former manager of the Chicago district.

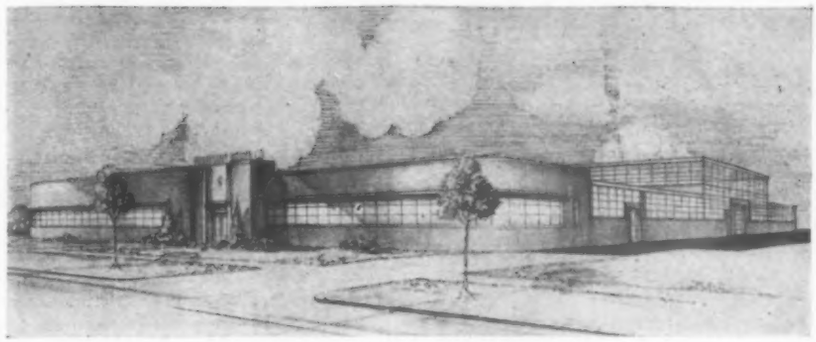
MAYNARD D. CHURCH has been elected vice-president of Worthington Pump & Machinery Corp., Harrison, N. J. Mr. Church is also president of Moore Steam Turbine Corp., Wellsville, N. Y., a Worthington subsidiary, and will continue to be in charge of Moore operations. R. W. TOWNE has been named assistant secretary of Worthington.

GEORGE J. CONNELLY, former division superintendent with the Packard Motor Co., has been appointed production manager and chief engineer of Covered Wagon Co., Mount Clemens, Mich.

RALPH M. HOFFMAN, vice-president and sales manager of the Link-Belt Co., Pacific division, San Francisco, for the past eight years, has been appointed assistant to the president of the parent organization, with headquarters at the company's general office at Chicago.

ADOLPH LARSEN has been appointed vice-president in charge of sales of the Gerrard Co., Chicago, Ill., instead of H. R. Morrison, as incorrectly announced in *American Machinist* for Nov. 15.

JOSEPH L. MCCLANE, general manager Republic Aviation Corp., Farmingdale, N. Y., has been elected vice-president and a director. He will also continue as general manager.



Progressive—*To occupy a three-acre site in Detroit, a 27,000-sq.ft. modernistic plant is now being built for five-year-old Progressive Welder Company*

I. C. MOREAU has been appointed assistant to L. S. WOOD, vice-president in charge of engineering Gar Wood Industries. Inc.

H. OLIVER WEST, former production chief with the Boeing Aircraft Co., Seattle, Wash., and more recently technical adviser in charge of ground organization and maintenance with the Trans-Canada Airlines, has been appointed special assistant to the president of Boeing Aircraft.

HENRY S. WINGATE, assistant to the president International Nickel Co., New York, N. Y., has been elected secretary.

BUSINESS ITEMS

Acme Steel Co., Chicago, Ill., is planning to spend $1,500,000 at its Riverdale plant. Improvements to be completed next year include new cold-rolling and scale-removal equipment.

Decatur Casting Co., Decatur, Ind., held open house Nov. 25. Over 2,200 persons attended, including the families of the company's employees, which number approximately 100. Working exhibits included the molding of souvenir cast iron paperweights, and various pieces of foundry and metal-working equipment. Particular interest was shown in the company's elaborate safety display.

Hayes Body Corp. Grand Rapids, Mich., is planning to change its name to Hayes Mfg. Corp. The company's charter now limits it to the manufacture of automobile bodies and certain metal products, but the organization is understood to be seeking the right to manufacture aircraft, accessories and other products in the aircraft field.

Laminated Shim Co., Long Island City, N. Y., is planning a new factory at Glenbrook, a suburb of Stamford, Conn., to be erected at a cost of approximately $80,000. Upon completion of the plant it is understood that the entire business will be moved to Connecticut.

Hannifin Mfg. Co., Chicago, Ill., has acquired the Rock River Machine Co., Janesville, Wis., and is operating it as one of its units.

Lansing Machinery Co., Watertown, N. Y., is installing machinery in the former foundry of the New York Air Brake Co. in Oswego, N. Y., to manufacture laundry equipment. It will confine its operations to machining and assembling.

McKenna Metals Co., Latrobe, Pa., has granted George H. Alexander Machinery Co., Ltd., Birmingham, England, an option on the McKenna patents to manufacture Kennametal in Great Britain.

Oilgear Co., Milwaukee, Wis., is building a $40,000 addition to its plant, to house its welding, painting and shipping departments and to provide more assembly space.

C. A. Olsen Mfg. Co., Elyria, Ohio, has been formed for the manufacture of warm-air furnaces and domestic air-conditioning units, and is occupying a plant formerly owned by American Rolling Mills Co. The new organization is headed by C. A. OLSEN, a former president of Fox Furnace Co., a subsidiary of American Radiator & Standard Sanitary Corp., and who is vice-president of the National Warm-Air Heating & Air Conditioning Association. ALMONG CHAPIN, formerly with Fox, is production manager. E. C. CARLSON, former general manager of Armstrong Furnace Co., is secretary and treasurer.

Turner Engineers, Inc., Springfield, Vt., will begin about the first of the year an invention and consultation service to help in execution of designs, details, models and patents of machine tools and other machinery.

FRED J. MILLER, PAST EDITOR OF AMERICAN MACHINIST, DIES

FRED J. MILLER

FRED J. MILLER, a former president of the American Society of Mechanical Engineers and for many years editor of *American Machinist*, died Nov. 26 from shock caused by a fall in his home at Centerbridge, Pa., which broke a collarbone. He was 82 years of age.

Born in Yellow Springs, Ohio, on Jan. 3, 1857, Mr. Miller was educated in public schools in both Massachusetts and Ohio. Learning the machinist trade, he began his career as toolmaker in the firm of Warder, Bushnell & Glessner, and soon thereafter became an early contributor to *American Machinist*. Coming to New York in 1887 as associate editor of *American Machinist*, he soon was made its editor-in-chief, and later became recognized as one of the leading writers in the technical field. In 1897 he spent several months in Europe studying and reporting on the equipment of, and conditions in, the leading machine industries of England and the Continent.

Leaving *American Machinist* in 1907, Mr. Miller became general manager of the five factories of the Remington Typewriter Co. He remained with them until 1918, when he was appointed a Major by the Ordnance Department and assigned to the Rock Island Arsenal, then to the Bethlehem Steel Co. for the War Department. He later served on the Pennsylvania Public Service Commission of Governor Pinchot in 1924–25.

In connection with Wallace Clark, he acted as consultant in industrial engineering work, and by joint action of the American Society of Mechanical Engineers and the Institute of Management, he was awarded the Gantt Medal in 1929. He had joined the A.S.M.E. in 1890 and was exceptionally active in its affairs, having become its president in 1920. He was also a member of the Hoover committee to study waste in industry and of the American Association for the Advancement of Science.

OBITUARIES

WILLIAM Y. BANKS, 54, manager of steel castings sales division at the Brackenridge plant of Allegheny Ludlum Steel Corp., died Nov. 23 at his home in Aspinwall, Pa.

ALBERT E. HARRIS, for over 40 years associated with the manufacturing and sales departments of the Brown & Sharpe Mfg. Co., Providence, R. I., died Nov. 30 in Providence following a short illness.

JOHN L. OSGOOD, president, treasurer and general manager of the J. L. Osgood Machinery & Tool Co., Brooklyn, N. Y., died Nov. 21.

HOWARD CLINTON RUSS, 67, president and director of the Beach-Russ Co., New York, N. Y., manufacturer of rotary pumps, died Nov. 29 in Groton, Conn.

PROF. GEORGE EARLE BEGGS, 56, chairman of the department of civil engineering, Princeton University, died Nov. 23 in Princeton, N. J., following an illness of several weeks. Professor Beggs had only recently been elected chairman of the Engineering Foundation.

JOSEPH A. WAGNER, for many years with the Detroit office of the Brown & Sharpe Mfg. Co., Providence, R. I., died Nov. 18 in Chicago. He had recently completed 36 years of service with the organization.

MEETINGS

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Winter meeting, Columbus, Ohio, Dec. 27-Jan. 2.

AMERICAN ENGINEERING COUNCIL. Annual meeting, Mayflower Hotel, Washington, D. C., Jan. 11–13.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Winter convention, New York, N. Y., Jan. 22–26.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS. Annual meeting, Blackstone Hotel, Chicago, Ill., Jan. 16–18.

SOCIETY OF AUTOMOTIVE ENGINEERS. Annual meeting, Book-Cadillac Hotel, Detroit, Mich., Jan. 15–19.

Exports of Machinery During October, 1939

Electrical machinery	$9,555,739	$8,062,687	$9,189,618
Power generating machinery except automotive and electric	1,125,961	1,113,665	1,185,543
Construction and conveying machinery	1,965,494	1,767,562	1,920,823
Mining, well and pumping machinery	4,448,900	4,500,147	4,582,379
Power driven, metal-working machinery	9,121,340	9,539,355	7,513,557
Other metal-working machinery	464,060	410,246	326,736
Textile machinery	753,869	819,714	565,109

Exports of Metal-Working Machinery During August, 1939

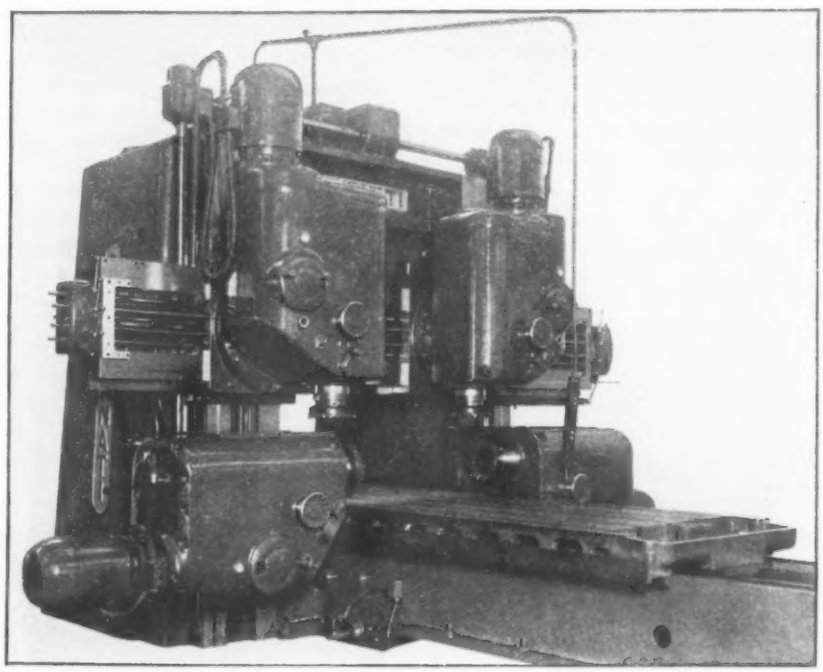
Engine lathes	$546,071	$418,944	$180,853
Turret lathes	764,549	746,052	454,970
Other lathes	335,440	279,041	176,854
Vertical boring mills and checking machines	315,315	498,728	126,763
Thread cutting and automatic screw machines	523,542	459,927	268,856
Knee and column type milling machines	649,627	644,152	232,360
Other milling machines	507,721	1,169,595	1,195,864
Gear cutting machines	505,383	222,090	264,610
Vertical drilling machines	96,616	111,185	17,345
Radial drilling machines	87,089	142,659	54,765
Other drilling machines	145,239	214,367	154,502
Planers and shapers	192,415	142,932	184,634
Surface grinding machines	279,525	190,523	276,113
External cylindrical grinding machines	430,569	192,638	167,084
Internal grinding machines	458,923	294,353	483,403
Tool grinding, cutter grinding, and universal grinding machines	325,388	278,275	284,665
Other metal-grinding machines and parts	625,358	471,071	439,057
Sheet and plate metal-working machines and parts	487,938	384,713	539,211
Forging machinery and parts	301,243	74,971	241,627
Rolling mill machinery and parts	381,931	1,038,370	685,381
Foundry and molding equipment and parts	135,600	216,405	374,149
Other power-driven metal-working machinery and parts	1,025,858	1,348,384	710,491

Other Metal-Working Machinery

Pneumatic portable tools	$120,293	$106,747	$95,547
Other portable and hand or foot-operated metal-working machines and parts	112,208	119,006	127,027
Chucks for machine tools	50,454	28,042	21,652
Milling cutters, machine-operated threading dies and taps, and similar machine-operated metal cutting tools	55,464	55,040	44,533
Other metal-working machine tools and parts	125,641	101,412	37,977

SHOP EQUIPMENT NEWS

Cincinnati Planer-Type Milling Machine Uses Self-Contained Milling Heads



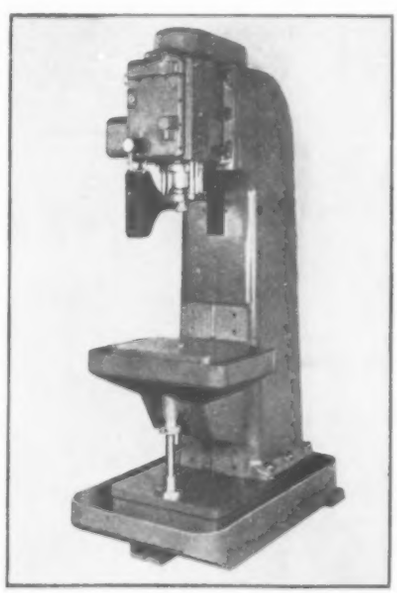
Milling heads on this 9½-in. quill, 60x48x168-in. "Hypro" planer-type milling machine, developed by the Cincinnati Planer Co., Cincinnati, Ohio, are completely self-contained units, powered by individual 20-hp. motors and lubricated by individual pumps. Each head has eight spindle speeds obtained by revolving a single cam which has a dial to indicate the various speeds. All heads are automatically fed or power traversed independently of each other. Shafts rotate in anti-friction bearings lubricated by the pump in each head and all gears in the spindle driving mechanism are shaved. Each head is provided with a safety device which prevents mechanical damage in the event that the head is fed or power traversed too far in any direction. All feeding and power traversing to the machine is controlled from the central pendant push-button station. This station can be swung to any position on either side of the machine, convenient to the operator. There are twelve cross and down feeds to each head, and a range of twelve feeds for moving the table in either direction.

Housings are of pyramid construction, reinforced inside with thick vertical and horizontal walls. Housings extend upward from the floor line and are held fast to the bed with a wide tongue and groove, dowels and bolts of large diameter. The bed is little more than twice the table length to prevent overhang of the table on maximum strokes. Table drive section through the center of the bed is reinforced to provide additional strength at this point. The all herringbone gear drive for the table is completely inclosed inside the bed. Oil drawn from the reservoir in the bed is filtered and delivered under pressure to the ways, table drive gearing and bearings. Inner guide bearings on the table and close-fitting hold down clamps absorb all side thrusts and lifting pressures exerted on the table by the cutters during milling operations. A clamping device mounted on the bed, convenient to the operator, locks the table in position for cross milling operations without exerting side or down pressure on the table or changing the oil film between the bed and table Vees.

The rail is designed to provide a narrow guide horizontal bearing to prevent binding of the head saddle during cross travel. Saddles are suspended on the rail by anti-friction rollers bearing on a hardened and ground inlaid steel strip running the full length of the rail. The rail is electrically clamped to the housing. Clamping pressure is equalized on a two-point bearing contact with the housings. An interlock between the rail clamping and rail elevating devices makes it impossible to damage either system by attempting to raise or lower the table while locked. This type of machine also is built with smaller milling heads equipped with 10-hp. motors.

LeMaire No. 5 Drill Operates Automatically

Incorporating standard drilling heads that have been used on station-type machines in the past, the No. 5 hydraulic-feed vertical drilling machines



offered by LeMaire Tool & Mfg. Co., 2657 S. Telegraph Road, Dearborn, Mich., can be used for either single or multiple spindle drilling, boring, reaming, counterboring, hollow-milling, chamfering and facing operations. The automatic operating cycle is started by means of a push-button easily accessible to the operator. Base of the machine incorporates a coolant tank and chip pan, while the column contains the coolant pump, electrical control panel, motor and counterweight. Provision has been made for adding sprockets and chains for counterweighting multiple-spindle heads.

The spindle power unit is contained in a separate, compact housing, mounted on the column, and is driven by V-belts from the motor in the column. It is readily adjustable for feeding lengths and rates. Provision has been made for jump feeds and delayed reverse. Both the hand lever for fine feed and the pushrod for rapid feed are accessible for set-up purposes. The table is secured to the column by means of screws and keys, and is adjustable for height. It is supported at the front by a jack screw and is provided with an accurately located center pilot hole for locating fixtures or indexing tables.

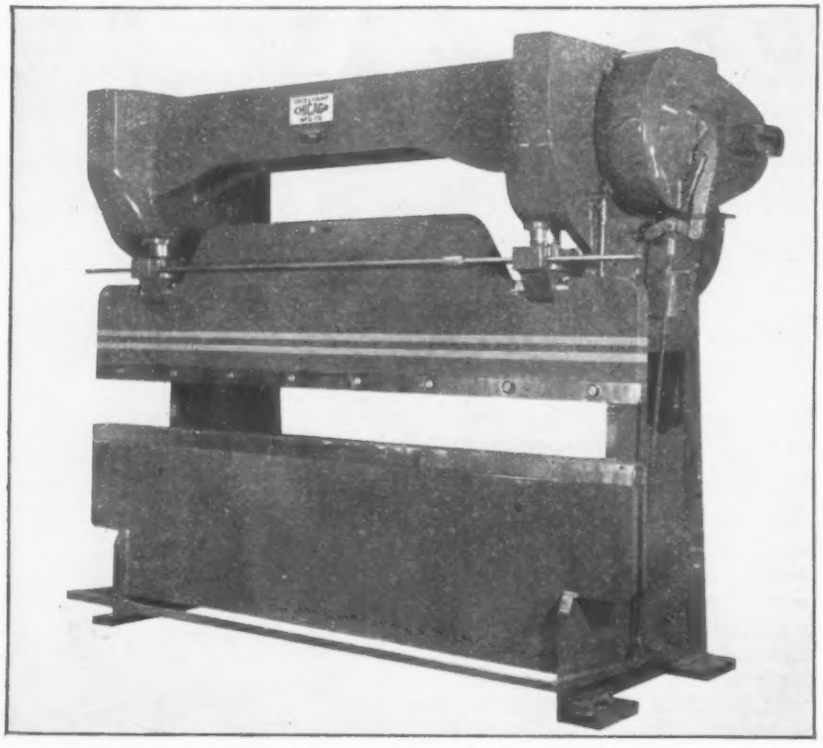
Specifications: Capacity, 1 in. in steel; spindle speeds, 300-3,200 r.p.m.; maximum thrust pressure, 3,000 lb.; forward traverse rate, 196 in. per min.; reverse traverse rate, 372 in. per min.; adjustable feed rate, 0-163 in. per min.; maximum stroke, 10 in.; table surface, 16x20 in.; height of table above floor, 27-39 in.; height of flanged quill above table, 19–31 in.; motor size, 3 hp.

"Chicago" Series L Steel Press Brakes Feature Variable-Speed Drive to Ram

Made in three sizes to bend $\frac{3}{16}$-in. plate 4 ft. long and up to No. 14 gage sheets 10 ft. long, the Series L "Chicago" steel press brakes offered by Dreis & Krump Mfg. Co., 7400 S. Loomis Blvd., Chicago, Ill., have a $2\frac{1}{2}$-in. stroke, 3-in. adjustment of ram, and $6\frac{1}{2}$-in. die space. Featured in this line of press brakes is the streamlined design, with all gears and working parts inclosed and running in oil, and an improved cushioned friction clutch. Housings, ram, bed and all main members are constructed of steel plate.

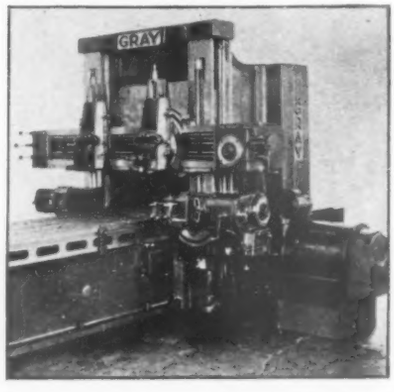
Press is of the crankless type, having a compact arrangement of gears and eccentrics inclosed and running in a bath of oil. Power is delivered to the ram at both ends. Main bull gears and eccentrics are made as one piece. Double back gearing is used. Adjusting screws are incased in sleeve-like plungers and are incased in a non-oscillating position throughout the stroke. Thrust is delivered direct to the ram.

The friction clutch has only one moving part and is said to require practically no adjustment. Brake is combined with the clutch and both operate by a simple direct movement. The variable speed drive operates the ram at any speed from 15 to 45 strokes per min.



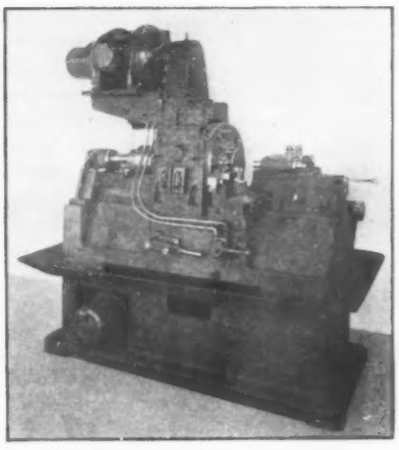
G. E. Planer Drive Has Simple Control

The improved variable-voltage drive for reversing planers, announced by General Electric Co., Schenectady, N. Y., is said to offer a wide speed range, extremely fast acceleration and deceleration, high cutting efficiency, accurate stopping and a simple system of control. In addition, the equipment gives independent selection of cut and return speeds, throughout the entire speed range desired, together with a maximum number of strokes per minute on all lengths of stroke. The drive itself consists of a direct-connected planer drive motor and an independent motor-generator set. A maximum of nine contactors and relays constitute all the operating devices on the control panel. Table speeds up to 240 ft. per min. can be obtained by using suitable gear ratios in the planer.



Special Coulter Machine Finishes Cartridge Cases

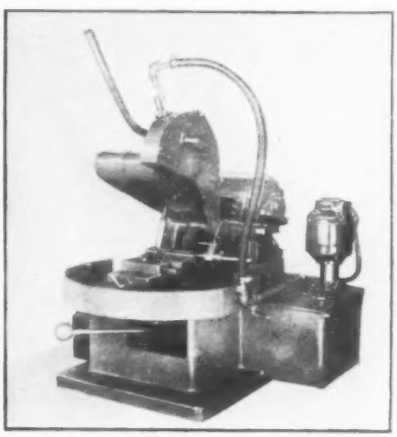
Automatic in all its operations, except in loading and unloading, this special cartridge case finishing machine developed by the James Coulter Machine Co., 386-404 Mountain Grove St., Bridgeport, Conn., will machine 5-in. cases in 25 sec., other



sizes are finished in proportionate times. Facing, contour turning, drilling, reaming, counterboring, open-end trimming to length and chamfering inside and outside all are automatically controlled. Separate tool slides are provided at each end of the machine, so that operations can be performed at the same time. The machine is completely motor-driven, the motors being equipped with brakes to reduce time lost in coasting. Cam feed shaft is arranged for hand operation to facilitate tool adjustments. It is said that the operator can load this machine in 5 to 7 sec.

Bridgeport "Abrasaw" Cuts Stock Rapidly

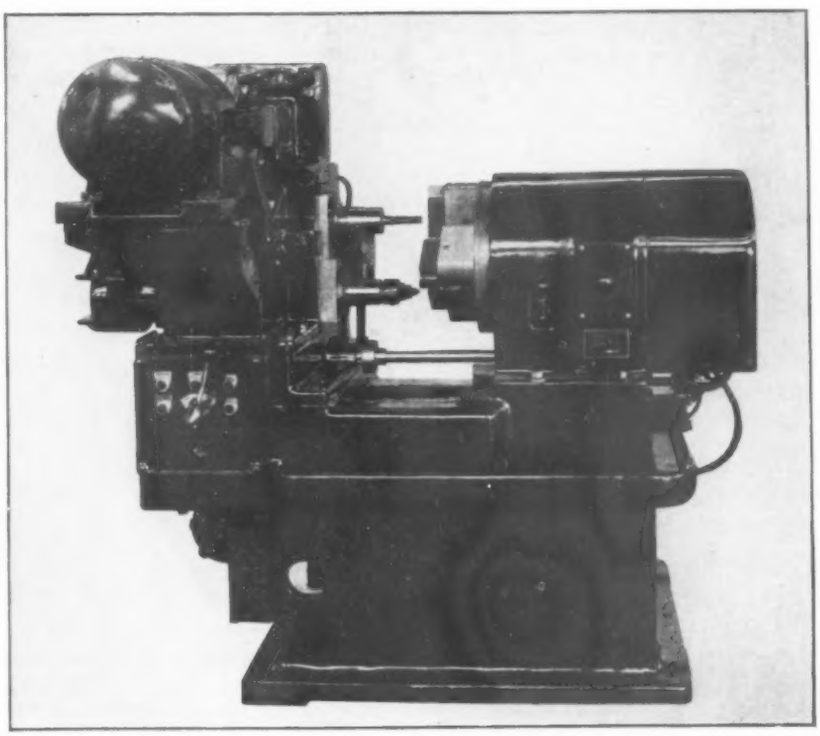
The No. 47-W "Abrasaw" wet cut-off machine announced by the Bridgeport Safety Emery Wheel Co., Inc., Bridgeport, Conn., has been developed as a companion to the No. 48-W cut-off machine for installations where lighter stock must be cut. This machine uses disks up to 12 in. diameter and from $\frac{1}{16}$ to $\frac{1}{8}$ in. thick. The disk head, which carries the 3-hp. motor, is arranged so that the driving motor balances the disk end, allowing sensitive control. It will cut solids up to 1 in. in diameter, and tubing or other light sections up to 2 in. Disk spindle is carried in extra-wide grease-sealed ball bearings.



Colaweld Atomic Welding Uses No Welding Tools

Atomic welding of stainless, low carbon and practically all ferrous alloys is claimed to be possible with a process developed by Colonial Alloys Co., Colonial Philadelphia Bldg., Philadelphia, Pa. The method employed is comparatively simple, and is done without welding apparatus or experienced welders. In this "Colaweld" method, Colalloy atomic welding liquid is brushed onto the metal at the points where the welding is to take place, the rod is applied, and the joint then is subjected to heating at about 450 F. The weld is completed in a matter of seconds. The lighter the gage of the metal, the faster the action, and the stronger the weld. Gages from 0.005 to 0.050 in. are said to lend themselves more readily to this method of securing an atomic welded bond. While preferable, it is not necessary to preclean the metals to be joined, nor to tin the joints. Colaweld can also atomically weld most other metals, both ferrous and non-ferrous, like monel, nickel, copper, brass, bronze, nickel-silver, aluminum, duralumin, lead, carbon steels and stainless steels.

Goss & deLeeuw Two-Spindle Chucker Designed for Easy Set-Up of Tooling



In the two spindle automatic chucking machine announced by Goss & deLeeuw Machine Co., New Britain, Conn., horizontal spindles revolve the cutting tools. Opposite them on a face plate are three work-holding chucks, two of them presenting the work to the tools, and the third in the upper position for loading and unloading. Indexing of the face plate carries the work successively from the loading position to the first spindle, then to the second spindle, and back to the loading position. Thus, two machining operations are performed simultaneously, while the loading is taking place. The finished piece can be ejected automatically from the chuck between the second position and the loading position. The operator has only to place the rough piece in the open chuck and trip the closing valve. All three mechanisms, consisting of indexing,

feeding and withdrawing the tools, and the starting, reversing and stopping of the threading spindle are automatic and are mechanically interlocked so that they cannot operate except in the proper succession.

Special attention has been paid in the design to facilitate the quick changing over from one set-up to another. The feed cycles are adjusted by quick-change pick-off gears, and spindle speeds through sheave changes. Lead screw is provided for threading tools, while the threading spindle is provided with a reversing electric motor drive. The 7-in. spacing between chuck centers, together with wide clearance while indexing permits the handling of large and irregular shaped pieces. Production cycles up to 1,800 per hr. can be obtained with the standard sets of pick-off gears. Spindle speeds range from 100 to 1,000 r.p.m. for threading and up to 3,500 r.p.m. for plain machining. Intended primarily for jobs requiring both plain machining and threading, the machine is equally adaptable to two combination operations of plain machining. Mounted on anti-friction bearings, the spindles are carried in their own separate slides and the feed for this slide is furnished by a hardened seal solid track cam. Indexing of the turret is obtained through the use of a Geneva motion. There are two rolls on the Geneva arm, each roll moving the turret 60 deg., making a total of 120 deg.

Geometric Precision Threading Machines Feature Waist-High Controls

The Nos. 16 and 11 threading machines, the latter a bench-type unit, offered by The Geometric Tool Co., New Haven, Conn., are designed for threading duplicate parts where precision and quantity production are required. The No. 16 threader, Fig. 1, will cut threads up to 1-in. diameter in the National Coarse Thread series and up to $1\frac{1}{2}$ in. in the fine pitch series. This machine provides a maximum distance of $7\frac{1}{2}$ in. from the vise to the die head, or $9\frac{3}{8}$ in. from collet to die head. Maximum length of thread is $5\frac{3}{4}$ in. with a vise, or 9 in. with a collet head. This machine requires a 28x51-in. floor space and weighs approximately 1,025 lb. It is driven with a 2-hp. motor and can be operated at from 55 to 1,200 r.p.m. by changing pick-off drive gears.

The No. 11 bench-type threader, Fig. 2, is shown mounted on a floor stand. Primarily intended for small diameters, fine-pitch threads up to $\frac{5}{16}$-in. diameter, this unit also may be used on finer pitches up to $\frac{9}{16}$-in. diameter. Either the Style KD rotary die head using conventional chasers or the Style TR rotary die employing tangent or circular chasers may be furnished with these machines. Maximum distance from vise to die head is $4\frac{1}{2}$ in.; from collet to die head the maximum distance is $5\frac{7}{8}$ in. Maximum length of thread is $3\frac{1}{2}$ in. with vise, or $5\frac{3}{8}$ in. with collet. Floor space required, 23 x 36 in.; net weight 305 lb. without pedestal; motor $\frac{1}{2}$ hp.; speed range, 155–1,605 r.p.m.

Waist-high controls, quick-acting holding devices, and automatic work gage, quickly removable oil hood and splash guard, and other features, combine to make these machines convenient to operate. Motor is mounted on the head of the No. 11 threader, and in the base of the No. 16 machine. Spindles are mounted in Timken tapered roller bearings, and removable shims are provided.

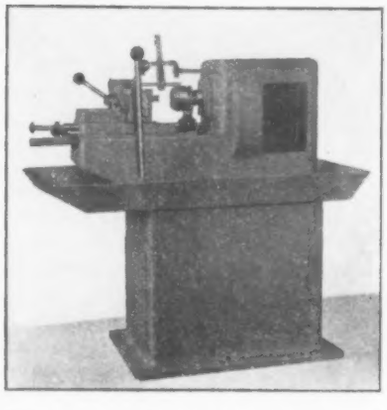


Fig. 1—Accurate, rapid production of cut threads can be accomplished on this No. 16 geometric threader

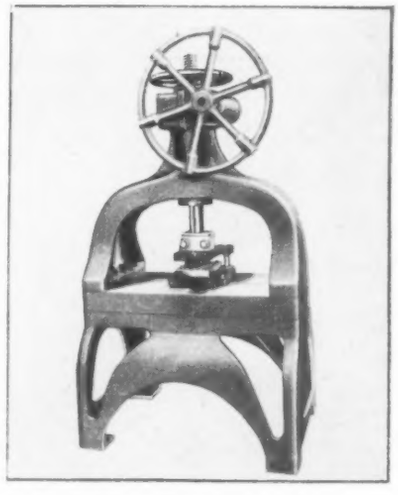
Fig. 2—The No. 11 bench-type geometric threader is suitable for threading small-diameter work

Trumbull Motor Starter Has 2-Hp. Capacity

The Type M-2, Size O magnetic starter placed on the market by The Trumbull Electric Mfg. Co., Plainville, Conn., is said to be particularly suitable for machine tool and allied applications which require that starters for fractional horsepower motors and motors up to 2 hp. provide undervoltage protection can be electrically interlocked with other starters. Consisting essentially of a three- or four-pole contactor with two hand or automatic reset isothermic temperature overload relays mounted on the contactor frame, this starter is arranged for convenient wiring. One pole of the contactor is used as a holding interlock, and extra interlocks can be added if required.

Producto Utility Press Has Several Uses

The utility press offered by The Producto Machine Co., 990 Housatonic Ave., Bridgeport, Conn., provides movement of the spindle through a worm and worm gear operated from the large hand wheel, and power equal to 50 ton pressure can be exerted. This press is recommended especially for (1) shearing punches



and dies in the tool room, (2) separating punch and die holders on large liner pin die sets, (3) assembling and aligning punches and dies, (4) straightening operations, (5) arbor press applications. It also is particularly suitable for short broaching operations, pressing pins from die sets, disassembling machine elements, and so on. Working surface of table measures 32x20 in. and the height of this surface from floor is 30 in. Machine measures 78 in. high and requires a 43x28 in. floor space. Maximum ram movement is 10 in. and the maximum distance from the working surface to the shank holder is 12 in. A 3⅛-in. hole is provided in the bed. Net weight, 2,100 lb.

Vertical Honing Machine Has Adjustable Table

The Model MMVT vertical honing machine announced by the Honing Equipment Corp., 4612 Woodward Ave., Detroit, Mich., will hone bores up to 2 in. diameter and 5 in. long. This machine has an adjustable work-table for small parts and a work-table arranged on the base for large pieces with small bores. The head of the machine also can be furnished mounted on a bench plate. The latter can be arranged in batteries of 2 or more when desirable.

Drive is through a four-step sheave using V-belts, giving four changes of speed of rotation and reciprocation. Stroke is infinitely variable for length of bore. A separate coolant system, complete with pump, electric motor, filter and reservoir, can be provided. Specifications: stroke, infinitely variable from 0 to 3 in.; distance from center of spindle to face of column, 10¼ in.; distance from nose of spindle to top of work-table on floor base, 50-53 in.; distance from nose of spindle to top of adjustable work-table when in highest position, 15-18 in.; working surface of adjustable and swinging table, 12½x17 in.; motor size, 1 or 2 hp.

Black Plated Finish By Du Pont Process

The "Moly-Black" (molybdenum-nickel) plating process developed by the Electroplating Div., E. I. duPont de Nemours & Co., Inc., Wilmington, Del., is said to represent an improvement in the production of black coatings by electro-deposition. Deep-black lustrous deposits suitable as protective and decorative finishes can be obtained without difficulty by the average plater. The plating is rapid—0.001 in. in 10 min. plating time.

This process operates in the usual nickel-plating equipment and is easily installed, maintained and controlled to produce consistently good results. The plating solution is made up and maintained from prepared salts. The solution is not sensitive to slight changes in operating conditions. The finish can be applied to a variety of base or plated metals, black deposits over iron or steel should be oiled or lacquered. For outdoor use, the black plate should be deposited over an undercoating of cadmium and then lacquered.

Wickes Center Drive Crankshaft Lathe Has Hydraulic Feed and Automatic Cycle

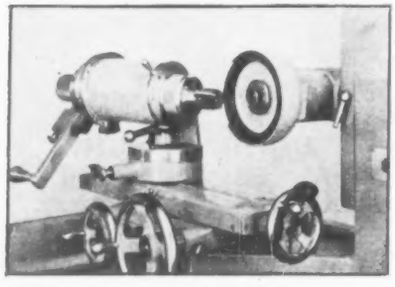
The Model CH-8 automatic, hydraulically operated center-drive type crankshaft lathe made by Wickes Brothers, 512 N. Water St., Saginaw, Mich., is shown arranged for machining the Nos. 1, 4 and 7 main line bearings and both ends of a heavy aeroplane-type crankshaft. With a change in tooling, the lathe can be used for machining the Nos. 2, 3, 5 and 6 main line bearings. Diesel-type crankshafts also can be machined.

The lathe has hydraulic feed with automatic work cycle and operation is controlled entirely from an electric pushbutton station. Both headstock and tailstock are movable on the bed to accommodate different lengths of crankshafts. Rear tools are mounted on inverted cross slides which are carried in the back tool housing in order to withstand the thrust on the rear tool bits. Main drive is by means of a 40-hp adjustable-speed d.c. motor through multiple V-belts to an inclosed gear reducer. A separate 7½-hp. motor is used to drive the hydraulic units. Forced feed lubrication is provided throughout. The center drive gear is mounted on large taper roller bearings and totally inclosed in a housing to prevent the entrance of chips and dirt. A large opening is provided in the center drive gear in order

to facilitate the loading and unloading of the crankshaft. Net weight without electrical equipment is 24,800 lb.

Bergram Attachment Grinds Tap Relief

The Type RG-1 tap relief grinding head, shown mounted on a "Utility" Type EMS-1 grinder, is offered by Bergram Mechanical Engineering Co., New Britain, Conn., for relieving ends of tap flutes at any selected angle by eccentric setting. Collet capacity is up to $1\frac{3}{8}$-in. diameter. Spindle and



draw tube are hollow, permitting the tap shank to be inserted up to the flutes. Grinding stops are adjustable for right- or left-hand taps. Index plates are interchangeable, with 24 notches in one plate, and 5 and 7 notches in the other, thus providing for any number of flutes from two through eight. Brackets are available for mounting the head on universal and surface grinders of various makes without change.

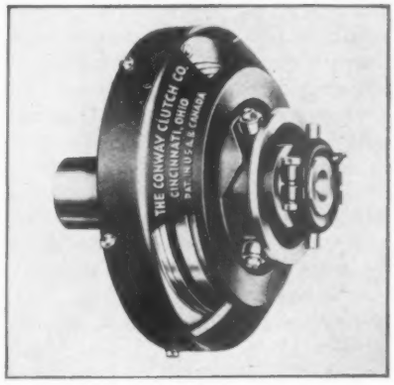
Rome Polishing Lathe Conveniently Operated

Arranged for convenient operation with a minimum amount of maintenance, the Model MOS polishing and buffing lathe offered by Rome

Machinery Sales & Engineering Co., 627-35 Webster St., Rome, N. Y., has a precision ball-bearing mounted wheel spindle. A plunger-actuated spindle lock engages a four station member to facilitate mounting or removal of wheels. Multiple V-belt spindle drive is totally inclosed by a cast guard which incorporates a removable cover plate for belt inspection. The totally inclosed ball-bearing motor is mounted on an automatic tension controlled base to provide proper operating belt tension under all load conditions. This lathe is available to 10-hp. capacity. Spindle ends are tapped and counterbored to permit the assembly of taper point attachments.

Conway Disk Clutches Provide Automatic Release

Substantially disk clutches, but embodying automatic safety features, a series of clutches offered by the Conway Clutch Co., 1537 Queen City Ave., Cincinnati, Ohio, have various arrangements. In one series, the clutch is arranged to slip at a predetermined



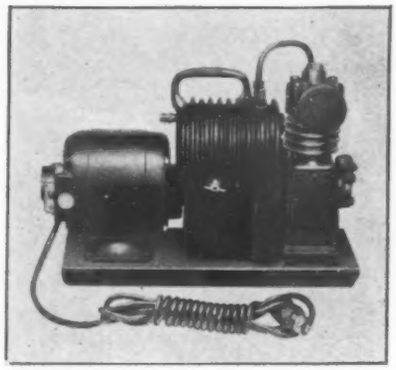
torque, permitting the machine to stop as soon as an obstruction or excessive torque is encountered. In another arrangement, the clutch slips as soon as an obstruction is encountered, but after a fraction of a revolution of slippage, the clutch disengages itself. Other features also are adaptable to this clutch, such as limit switches which act directly off the clutch to disengage the electrical equipment. These automatic release and slip clutches are adaptable to a variety of machines and conveying systems where an obstruction may cause expensive damage.

"Doall" Precision Surface Grinder Features Cutter Grinding Head

The basic precision surface grinder developed by The Doall Co., affiliated with Continental Machines, Inc., 1301 Washington Ave., S., Minneapolis, Minn., also can be arranged as a universal cutter grinder, or as a combination machine having interchangeable heads. By mounting a magnetic chuck on the work table, and using the surface grinding head, surface grinding operations can be performed. A special Dumore head and a compound table are mounted on the machine for cutter grinding.

The work table of this machine rides on ball bearings and hardened steel wear strips, which can be removed and reground. For surface grinding, a balanced built-in motor driven spindle is provided. This is a completely inclosed unit, ball bearing mounted, and driven by a 1 hp. motor. The spindle may be set at any angle up to 30 deg. The back edge of the wheel cover forms a reflector which carries a 9 in. fluorescent lamp. Position of this light makes it possible to see the job without strain from light shining in the eyes.

The dividing head provided for cutter grinding has two graduated axes and can be passed laterally across the compound table at any angle by using a hand lever. For cylindrical grinding, a head stock is provided which drives the work between centers. The surface grinder head operates at 3,450 r.p.m. and can use a 7 x $\frac{1}{2}$ x $1\frac{1}{4}$ in. wheel. Cutter grinder head operates at 5,700 to 35,000 r.p.m. and uses a $\frac{3}{16}$ to 4 in. wheel. Working range of the machine is 6 x 16 x 12 in. Net weight, 1,800 lb.

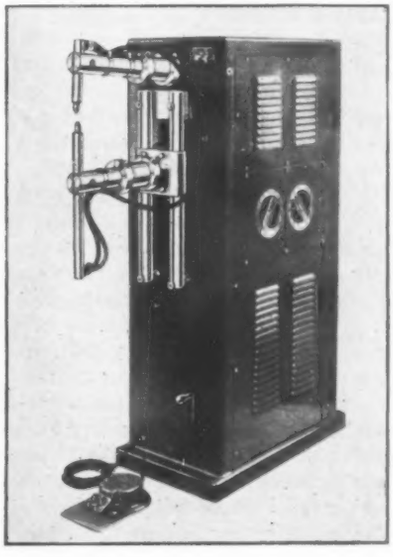


DeVilbiss Compressor Made for Spray Painting

This direct-drive Type NCK spray-painting compressor is operated by a ⅓-hp. motor and has a displacement of 4.58 cu. ft. per min. Maximum working pressure is 40 lb. The finned air chamber relieves pulsation and serves as an oil and moisture separator. The unit is provided with a safety valve, drain valve and connection for hose. It may be supplied with three different spray equipments.

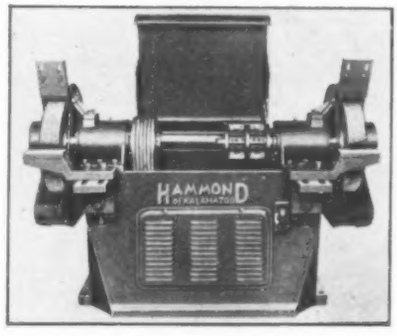
Improved Pier Welders Have 50 KW. Capacity

Two 50 kw. capacity "Ace" welders which can be used for spot or projection welding and, with suitable fixtures, for butt welding, have been announced by Pier Equipment Mfg. Co., 801 Cross Street, Benton Harbor, Mich. One is a motor-driven, automatically-operated unit and the other is operated by means of a swivel-jointed treadle. Both incorporate a recessed automatic trip control and timing adjustment, as well as an eight-point heat regulating switch for adjusting secondary voltages and current. Four throat depths are available, and the lower horn may be adjusted to provide spacing up to 15 in. on standard welders. The transformers regularly are furnished for operation on 220 volt, 60 cycle supply circuits.



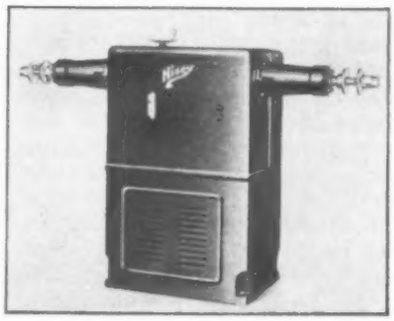
Hammond "WR" Grinder Driven by V-Belts

The Type WR single-speed floor-type grinder, offered by Hammond Machinery Builders, Inc., 1618 Douglas Ave., Kalamazoo, Mich., has a motor mounted in the base with a multiple V-belt drive connecting the motor and the spindle. This machine also may be supplied with two, three or four speeds, for 24- to 30-in. wheels with motors up to 20 hp. The single-speed machine shown is arranged for 20-in. diameter wheels. When changing belts, it is unnecessary to disturb the spindle assembly.



Parts Cleaned Easily In Bendix Liquid Cleaner

"Bendix Cleaner" announced by Bendix Products Div., Bendix Aviation Corp., South Bend, Ind., is a cold immersion liquid cleaner said to be fast in action. It is fire-safe, non-toxic and non-corrosive. This cleaner removes dirt, grease, carbon and gum, and softens and loosens paint and lacquer. It will not blacken, pit or attack any metal alloy. Parts are simply immersed in a bath, left there until the cleaner has done its work, rinsed, and removed. Scraping and wire brushing are eliminated. Foreign material removed from parts is precipitated out of the cleaner as sludge; the cleaner itself remains clean and of undiminished strength.



Hisey Polishing Lathe Has Variable Speeds

Equipped with a multiple V-belt drive, this improved infinitely variable speed buffing and polishing lathe, announced by the Hisey-Wolf Machine Co., Cincinnati, Ohio, is arranged so that spindle speed can be changed while the machine is under a working load. Speed range is from 1,000 to 3,500 r.p.m. and the speed dial plate at the front of the machine indicates spindle speed directly. It is made in 3-, 5- and 7½-hp. capacities and can be fitted with any N.E.M.A. motor of any electrical characteristics.

G. E. Portable Units Permit Dynamic Balancing

A portable dynamic balancing equipment has been developed by General Electric Co., Schenectady, N. Y., for use wherever rotating masses require balancing to eliminate vibration. The device is a self-contained precision instrument capable of measuring the amount and phase angle of unbalanced vibration present in the bearing pedestals of a rotating machine running in its own or substitute bearings at any speed between 600 and 5,000 r.p.m. Because the balance is made under operating conditions, this equipment is said to improve the quality of the result, as the changes

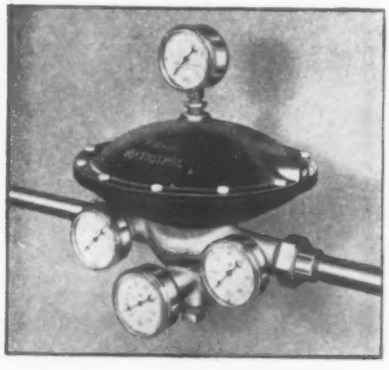
effected by load and by the foundations are included. The complete equipment, packed in a single case with no batteries or external power source required, consists of a sine-wave alternator, a vibration pick-up, and an instrument with its associated circuit on which mils displacement of the vibration are read. In balancing any equipment, the sine-wave alternator spindle is inserted in a lathe center hole in either end of the rotor of the machine, and the vibration pick-up is placed against the rotor bearing. The two voltages generated in the sine-wave alternator and vibration velocity unit are applied to the measuring instrument.

Frequency Analyzer Records Sound Levels

A permanent chart of sound levels at various frequencies is provided by the recording frequency analyzer offered by Electrical Research Products, Inc., 195 Broadway, New York, N. Y., for use as an industrial stethoscope. The equipment employs frequency anaylsis by the "sweep" method, using a small drive motor to actuate the frequency dial which sweeps the whole range of frequencies from 30 to 10,000 cycles per second. With this motor is synchronized another motor driving a band of graph paper on which a stylus traces the sound level at each frequency passed.

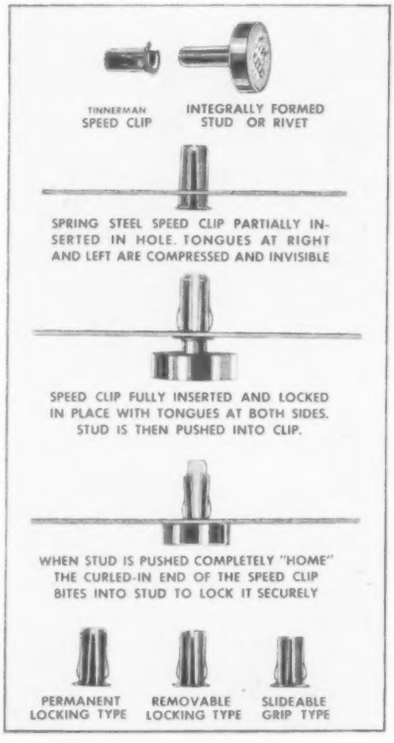
Air-Oil "Ratiotrol" Controls Oil Furnaces

The North American Mfg. Co., 2910 E. 75th St., Cleveland, Ohio, has developed the air-oil "Ratiotrol" control unit for maintaining correct proportions of air to oil when controlling burners in an oil-fired furnace. One unit will control one or several burners within the capacity range. This capacity is 90 gal. of oil per hour for single burner control, and 60 gal. of oil per hour for multiple burner control. Proportioning is effected by controlling pressures and making them dependent upon each other.



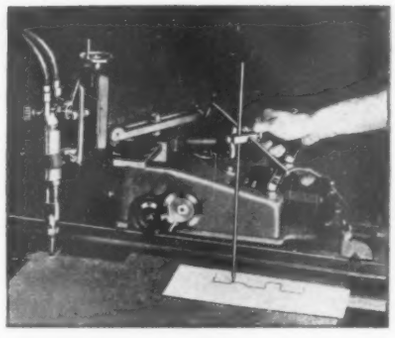
Tinnerman "Speed Clip" Nails Parts Together

The "Speed Clip" fastening device developed by the Speed Nut Div., Tinnerman Stove & Range Co., 2038-2048 Fulton Rd., Cleveland, Ohio, fastens metal parts together without the need of gaining access to the opposite side of the assembly as is required with nuts, bolts or threaded studs. The device is a tubular-like formation of spring steel, cylindrical in shape. When the speed clip enters the hole, two cam-like tongues spring out and lock the clip in position. The flanged end prevents the clip from passing completely through the hole. When the stud is pushed home, the clip is fully expanded and the clip bites into the stud to lock it securely. No tools are required for assembling these units.


TINNERMAN SPEED CLIP
INTEGRALLY FORMED STUD OR RIVET
SPRING STEEL SPEED CLIP PARTIALLY INSERTED IN HOLE. TONGUES AT RIGHT AND LEFT ARE COMPRESSED AND INVISIBLE
SPEED CLIP FULLY INSERTED AND LOCKED IN PLACE WITH TONGUES AT BOTH SIDES. STUD IS THEN PUSHED INTO CLIP.
WHEN STUD IS PUSHED COMPLETELY "HOME" THE CURLED-IN END OF THE SPEED CLIP BITES INTO STUD TO LOCK IT SECURELY
PERMANENT LOCKING TYPE
REMOVABLE LOCKING TYPE
SLIDEABLE GRIP TYPE

Steel Cut Rapidly With "Flame-Shaper"

The Model C "Flame-Shaper" developed by Schrader-Bowers Co., 2629 Lincoln Way West, Mishawaka, Ind., is a portable flame cutter which provides stepless cutting speeds ranging from 4 to 40 in. per min., depending on the thickness of the metal being cut, without varying the speed of the motor. Transmission control is by centrifugal governor set by a dial which is calibrated in inches per minute. The manually-operated lateral carriage has a 12-in. travel.



This small unit cuts straight lines and circles with square or beveled edge, irregular shapes with sharp, square corners, and a large variety of irregular curves for small intricate cuts. A convenient tracer guide is available for following drawings or templets. Plate up to 8 in. thick can be cut smoothly. Standard equipment includes a torch with one tip, radius rod and center point for circle cutting, travel guide attachment, and a 6 ft. section of track. Automatic free wheeling permits this flame shaper to be pushed or pulled into any position on the track without shifting gears or releasing the clutch. Torch holder is easily positioned to any desired angle. Weight of the machine is 50 lb., while the 6 ft. section of track weighs 17 lb.

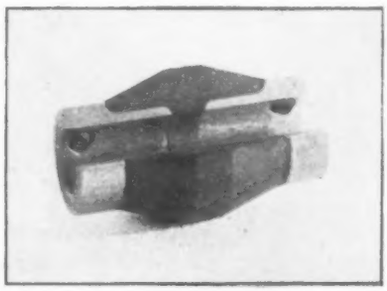
G. E. Plating Rectifier Has Voltage Regulator

A fan-cooled copper-oxide rectifier suitable for electro-plating service has been made available in several ratings by the Appliance and Merchandise Dept., General Electric Co., Schenectady, N. Y. To give the operator complete control of the tank, a separate voltage regulator is available for use with this rectifier. Separate units can be used for each electroplating tank, in place of a large unit serving severanl tanks as is customary with rotary equipment. Thus, approximately full-load efficiency can be maintained at all times. The rectifiers are built from standard sectional units to obtain flexibility in output capacities. The hand-operated voltage regulator is available in several sizes so that any

number of parallel rectifier units from one to seven can be controlled simultaneously from one regulator. The standard 6-volt sectional rectifier unit is rated at 300 amp., and the 12-volt unit is rated at 150 amp. By paralleling two or more sections any desired current capacity can be obtained.

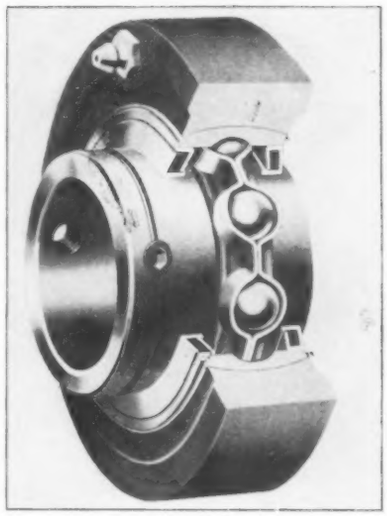
DeVilbiss Spray Gun For Touch-Up Work

The Type AG spray gun produced by the DeVilbiss Co., Toledo, Ohio, supplies a range of service from the drawing of a fine pencil line to the laying of a broad soft spray. Available in a choice of three nozzle combinations which are adjustable for either round or fan spray applications, the gun offers a maximum spray width of 3 in. Control of both width and density of spray is said to be accurate and simple.



Bonded Rubber Used In Lord Flexible Coupling

A line of bonded-rubber couplings of compact design is offered by Lord Mfg. Co., Erie, Pa., in sizes from $\frac{1}{16}$ to 1 hp. These couplings are complete units, there are no loose parts. They will accommodate both parallel and angular misalignment and will absorb torsional vibrations. It is said that they will prevent transfer of gear noise and motor hum through the shaft.



S-A Cartridge Units Have Labyrinth Seals

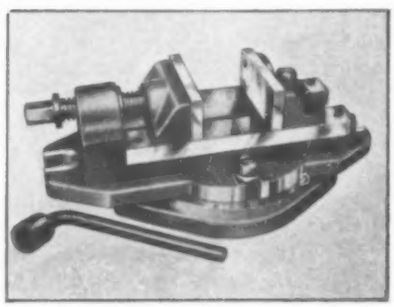
Stephens-Adamson Mfg. Co., Aurora, Ill., has announced the addition of self-aligning ball bearing cartridge units to the "Sealmaster" bearing line. The centrifugal labyrinth seal used in these cartridge units is said to effectively seal the bearing from all foreign materials in the atmosphere and to retain the lubricant. Misalignment of the shaft cannot interfere with the effectiveness of the seal, as the bearing's outer race is ground on a radius and locked in the ground housing socket with a nipple which permits 2 to 4 deg. misalignment in any direction. Felts in the seal are assembled without pressure, thus avoiding wear or glazing.

Improved Anode Bags Impregnated with Resin

Style D anode bags, developed by Hanson-Van Winkle-Munning Co., Matawan, N. J., are made from a closely woven sanforized drill material and are impregnated top and bottom with a red resin. The impregnated resin tip is said to prolong the life of the bag by protecting against changing solution levels, and the impregnated bottom forms a pocket for holding the sludge, largely carbon, which accumulates as the anode corrodes. These bags are 5 in. wide and for anodes 12 to 20 in. long the bags are 4 in. longer than the anode. Anodes 20 to 40 in. long require bags 5 in. longer than the anode, as there is more room needed for the collection of sludge. In place of draw strings, these bags are fastened to the anodes by two pieces of tape which pass through holes punched through the bag. By collecting the sludge in the bag, the solution in the tank is kept cleaner and deposits are smoother.

Hardened Plates Used in Producto 4½-in. Vise

Available in swivel and plain types, the 4½-in. vise offered by Producto Machine Co., 990 Housatonic Ave., Bridgeport, Conn., is reinforced on the top of the body with hardened and ground wearing and jaw guide plates. The rear jaw is movable along these hardened ways to fit the work to be clamped. A serrated shoe engages serrations in the hardened wearing plate when the movable jaw is clamped in position. Swivel base is graduated to 180 deg. Specifications: width of jaws, 4½ in.; depth of jaws, 1⅞ in.; maximum opening, 4½ in.



Flexible Pad Used on Sterling "Gyro" Sander

The "Gyro" self-contained sander announced by Sterling Products Co., 2457 Woodward Ave., Detroit, Mich., is gear-driven by an electric motor which can be plugged into any lighting circuit. The flexible sanding pad operates in a movement which closely simulates hand sanding. Operating at 4,000 r.p.m., it is claimed that this portable tool will

do a sanding job in a fraction of the time required by hand. Abrasive paper is easily attached to the sanding pad and is held in place by a special holder. It uses one-fourth of a standard 9x11 sheet. This tool also can be used for rubbing and polishing, in which case cloths are attached to the pad. Weight of the tool is 3½ lb.

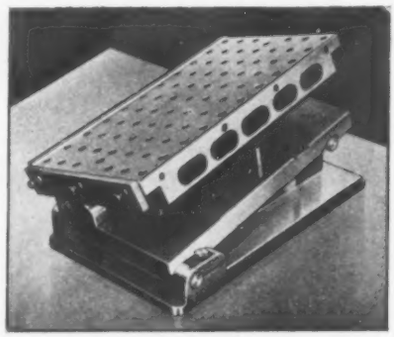
Wheel Dresser Fits Contour Grinder

The No. 155 diamond wheel dresser offered by Stanley Electric Tool Div., The Stanley Works, New Britain, Conn., was developed especially for use with the No. 150 Stanley contour grinder, previously announced

(*AM*—Vol. 83, page 116). This fixture provides a means of truing and dressing grinding wheels or points. A ring on the bottom of the dresser fits in a counterbored hole on the table top of the grinder. Adjusting screws are provided for setting the dresser.

Packing Lubricant Easily Applied

Compounded especially for use as a packing lubricant, Formula No. 61725 lubricant offered by Industrial Colloids Corp., 1316 W. Cermak Road, Chicago, Ill., is intended for application to exterior surfaces of the packing prior to its installation, or directly to the stuffing box after installation has been made. This lubricant is not restricted as to pressures and is recommended for all temperatures up to 1,000 F. It is suitable for application on all types of packing, whether metallic or fibrous. In addition to being a durable lubricant, this product is claimed to form an actual metallic surface, or covering, upon the packing. Also offered is a high temperature lubricant, a high temperature joint compound and a plastic gasket.

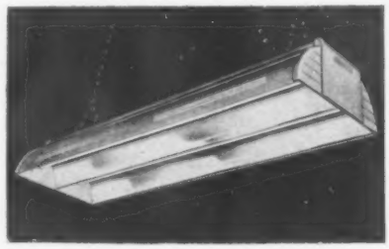


Robbins Sine Plate Checks Angular Work

The Robbins Engineering Co., 635 Mt. Elliott Ave., Detroit, Mich., has developed this non-magnetic sine plate to supplement the "Magna-Sine" line of magnetic sine plates. It is intended for use in inspection departments for accurate checking of angular machine work. Standard gage blocks are used for setting the plate to the required angle or combination of angles. Both compound and single angle types are furnished.

Benjamin "Flur-O-Liter" Uses Two 40-Watt Lamps

For local lighting applications, the "Flur-O-Liter" offered by Benjamin Electric Mfg. Co., 120–128 S. Sangamon St., Des Plaines, Ill., concentrates from 100 to 150 foot-candles of light over the work when located from 3 to 4 ft. above the machine or



bench. When mounted 15 ft. above the floor and based on 10-ft. centers, average intensities of 20 foot-candles are obtained generally over the room with a minimum of light lost high on the side walls. This twin-lamp fluorescent fixture is arranged for two 48-in., 40-watt lamps. It incorporates individual reflectors for each lamp, sockets with thermal glow-switch starters and line ballast equipment for regulating current to the lamps.

Colonial "Chromaloy" Needs No Finishing

"Chromaloy," a light-weight, rust-proof, stainless metal that will not oxidize or tarnish is offered by Colonial Alloys Co., Colonial Philadelphia Building, Philadelphia, Pa., in mirror or satin finishes. It is available in all standard sizes and gages. Chromaloy is non-ferrous and can be formed where the drawing is not severe. It is recommended for flat upright surfaces. This material is a form of "Colalloy" which was announced in 1938 (*AM*—Vol. 82, page 1160), and is made up of manganese, magnesium, silicon, aluminum, and some lesser proportions of other metals.

Dietzgen "Autodraft" is Portable Drawing Machine

The portable "Autodraft" drawing machine offered by Eugene Dietzgen Co., 2425 Sheffield Ave., Chicago, Ill., provides a drawing board, a

T-square, a triangle, a scale, a protractor and paper clamps. The protractor mechanism is held by a permanently attached semi-universal arm which swings over the entire surface of the board. The drawing board is made of light-weight Preswood in 9x12- and 12x18-in. sizes.

Gale Liquid Conditioner Removes Oils and Greases

A "Liquid Conditioner" developed by Gale Products Co., 50 West St., New York, N. Y., separates liquids having different specific gravities or floatable solids from a liquid in which they

Now.. MAKE PRECISION TOOLS AND DIES IN A SINGLE SET-UP.. *More Rapidly More Accurately*

- In this Rotary Head Tool and Die Milling Machine — Kearney & Trecker brings to industry a mechanical achievement which assures unprecedented speed—economy and accuracy in precision tool and die making.
- Its unique design emphasizes its rotary head construction — for the first time a machine is available to complete precision tools and dies at one set-up.
- This machine transmits blueprint into steel faultlessly. Think of it, layout, milling, drilling, precision boring and slotting operations can now be completed without resetting — this results in both saving of time and increased accuracy.
- Send for bulletin which describes this new and revolutionary tool and die milling machine.

Send for Bulletin No. 1002.

SEND FOR BULLETIN No. 1002

KEARNEY & TRECKER CORPORATION
MILWAUKEE, WISCONSIN, U. S. A.

may be carried. It is especially suitable for intercepting, separating and reclaiming oil, oily substances and greases from water. It can operate continuously and has a wide range of capacities. This conditioner works automatically, by gravity, and has no moving parts.

Houghton "Ferritrol" Prevents Scaling

"Ferritrol" is a preparation offered by E. F. Houghton & Co., 240 W. Somerset St., Philadelphia, Pa., for application to ordinary carbon steels to prevent oxidation and scaling at high temperatures. It provides a permanent surface coating which will not chip, scale or oxidize under high heat for long periods of time. This compound consists of a vehicle and pigment packed together in the same package. The surface must be thoroughly cleaned and any dirt or grease removed with a solvent and allowed to dry thoroughly. Pickling or sandblasting must be done if scale exists, before applying the Ferritrol. Its principal application in the heat-treating industry is to protect steel carburizing boxes, annealing covers and structural parts exposed to heat in all types of furnaces.

Motor-Driven Reels Handle Light Coils

A complete line of light-duty motor-driven duty reels and winders has been announced by the F. J. Littell Machine Co., 4125 Ravenswood Ave., Chicago, Ill. These reels are designed for carrying light-gage material in coils up to 300 lb., and are for use with automatic punch presses. Included in the line is an automatic centering reel, a plain reel with arms, a plate-type reel and a scrap winder. These reels are fitted with adjustable brakes, Mercoid loop controls and are driven by ¼-hp. geared head motors through V-belt drives. The reels can be used for unreeling stock from right-to-left or left-to-right simply by switching the loop control arm from one side to the other. They are adjustable in height and can be tilted to any angle.

Davis Preparation Relieves Burn Pains

"Tannoid" preparation, consisting of a water-soluble jelly containing the proper proportion of tannic acid, is offered for first-aid work by the Davis Emergency Equipment Co., 55 Van Dam St., New York, N. Y. When applied to the burn, this preparation is said to relieve the pain, lessen the toxic effect, and reduce the formation of hard tissue. It is merely spread on the burn from a collapsible tube and covered with a compress. Being water-soluble, it is easily and painlessly removable, if further treatment is required.

G.E. Wiring Devices Simplify Lamp Use

To simplify the wiring and mounting of fluorescent lamps, a replaceable switch and condenser unit, known as the fluorescent lamp starter, has been introduced by the General Electric Co., Schenectady, N. Y. A new lampholder, No. 78X729, has been designed for use with this starter. This assembly simplifies the maintenance of these units. When mounted in the lampholder, the starter projects through a reflector of channel surface immediately below the lamp. It is

OWN THIS SET OF LUFKIN INSIDE MIKES

Lufkin precision built Inside Micrometers measure accurately whether set for 1½" or extended to 40". This is because the tubular extension rods are made of stiff steel that assure uniformity at every point.

For perfection in balance, feel and readability, you will want a set of Lufkin Inside Micrometers because they are the only Micrometers that allow extensions at both ends of the Micrometer Head, thereby keeping it in the center — the vital spot for accurate measuring.

Lufkin Inside Micrometers come in six sets — with range from 1½ to 8 inches up to 4 to 40 inches.

Go to your dealer and handle these precision tools yourself, or write us for your free copy of Catalog No. 7.

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THE LUFKIN RULE CO SAGINAW, MICHIGAN
Canadian Factory WINDSOR, ONT.
TAPES — RULES — PRECISION TOOLS

inserted and locked in contact by a slight turn. Reversing this procedure removes the starter.

Estox Coating Protects Metal

A rust preventative and protective coating for practically all metal products, the "Metaseal 494" coating offered by Estox Products Co., 151-2 Brewery St., New Haven, Conn., may be applied by dipping, spraying or brushing, and needs no special equipment for its application. It is claimed that this product will definitely seal clean metal products for a period of 9 to 12 months, either in storage or during shipment, or while in process through the plant.

NEW BOOKS

THE GLASS GIANT OF PALOMAR—*By David O. Woodbury. Dodd, Mead & Co., 449 Fourth Ave., New York, $3.00.*

David O. Woodbury has written a lively story of scientific adventure. A large, attractive volume, it surveys briefly the development of telescope-making up to the conception of making and installing a 200-inch mirror in Palomar, in Southern California; and the bulk of the narrative deals with the problems involved in its construction.

The late George Ellery Hale figures as the inspiration, the money-getter and the driving force behind the project. The book gives much space to him, to his background, his journeys and his interviews with scientists and donors. But not neglected are his associates, nor the less conspicuous workmen. Bright little anecdotes about the astronomers, the mechanics, the glass-pourers, the road-makers and the truck-drivers intersperse the account of the engineering and financial problems. What otherwise might be just a technical treatise comes alive as man after man meets the challenge of his phase of the big job. There is excitement among the workmen at Corning over making the smaller mirrors as well as the giant. There are difficulties of transportation across the continent. There are tremendous problems in polishing the mirror and in making and mounting the big telescope on the mountain-top.

Ample credit is given to the patient and often discouraging labors of the manufacturers and contractors. Enough details of the engineering and scientific aspects are presented to satisfy the average technical reader without overburdening the layman. Photographs, drawings by the author and sketches by Russell W. Porter, chief designer of the Palomar telescope, are introduced to advantage.

The author gives evidence of having spent much time and labor in collecting material for the book. The writing itself seems to have been done at breakneck speed, but it is colorful, well organized, and in keeping with the earnest and enthusiastic spirit of the whole undertaking.

TRADE PUBLICATIONS

AIR CONDITIONING Contribution of "Turbovac" units toward simplifying air conditioning installations is discussed in Bulletin No. S399, published by the Trane Co., LaCrosse, Wis.

BAR MACHINE Design and operating features of the Model RA 4-, 6- and 8-spindle automatic bar machine offered by the National Acme Co., 170 E. 131st St., Cleveland,

All geared 21" 24" and 28"
SUPER SERVICE UPRIGHTS

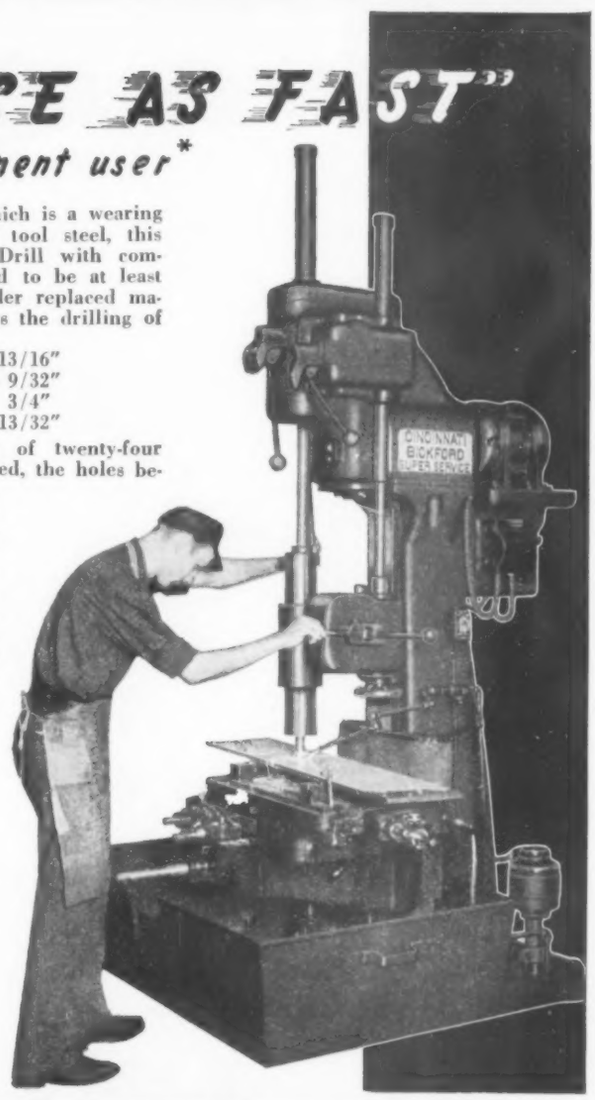
"At least
TWICE AS FAST"
says prominent user*

On the work shown, which is a wearing plate of oil hardening tool steel, this Super-Service Upright Drill with compound table, is reported to be at least twice as fast as the older replaced machine. This job involves the drilling of holes

two 1-13/16"
two 1- 9/32"
four 3/4"
twenty-four 13/32"

and the counterboring of twenty-four ¾" holes. No jig is used, the holes being located with the aid of the compound table and center-distances held to limits of ±.005". Time required is now 1½ hours, former time 3 hours. A similar replacement and like savings may be possible in your shop. Write for complete information.

*Customer's name on request.



THE CINCINNATI BICKFORD TOOL CO.
OAKLEY CINCINNATI OHIO U.S.A.

Ohio, are provided in a 24-page illustrated Catalog No. M-40.

BRAZING "How to Torch Braze Carboloy Tools," an 8-page illustrated bulletin, No. GT-116, has been issued by the Carboloy Co., Inc., 11149 East 8 Mile Road, Detroit, Mich.

BROACHING Bulletin No. 925000, issued by the Oilgear Co., 1323 W. Bruce St., Milwaukee, Wis., provides 12 pages of specifications of its Type XP vertical pull-down broaching machines.

BRONZE Johnson Bronze Co., 310 S. Mill St., New Castle, Pa., is distributing a wall chart listing specifications of its line of bronze bars.

CARBURIZING FURNACE Catalog No. T-623, issued by Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia, Pa., gives detailed information regarding an automatically controlled "Homocarb" carburizing furnace.

CIRCUIT BREAKERS Air circuit breakers for protection of resistance welding machines up to 600 volts a.c. are described in an eight-page illustrated bulletin, No. GEA-29978, published by the General Electric Co., Schenectady, N. Y.

CYLINDERS Applications of a line of hydraulic lifting cylinders are illustrated in a four-page bulletin, No. B-8, issued by the Curtis Pneumatic Machinery Co., St. Louis, Mo.

DIES Wales notching and punching dies and stripping units are discussed in Bulletin A, issued by the Strippit Corp., 1559 Niagara St., Buffalo, N. Y.

DUST CONTROL A series of folders distributed by the Pangborn Corp., Hagerstown, Md., discusses efficient dust control.

FORMING Bulletin No. 77-A, published by Niagara Machine & Tool Works, 637–697 Northland Ave., Buffalo, N. Y., contains 16 pages of illustrations and specifications covering a line of hand and power operated slip-roll forming machines.

GAGE PLUGS Gear case oil gage plugs are described in an illustrated leaflet issued by Gits Bros. Mfg. Co., 1854 S. Kilbourn Ave., Chicago, Ill.

GASKETS Specifications and applications of "Metallo" gaskets are provided in a 16-page illustrated bulletin released by Metallo Gasket Co., 10–18 Bethany St., New Brunswick, N. J.

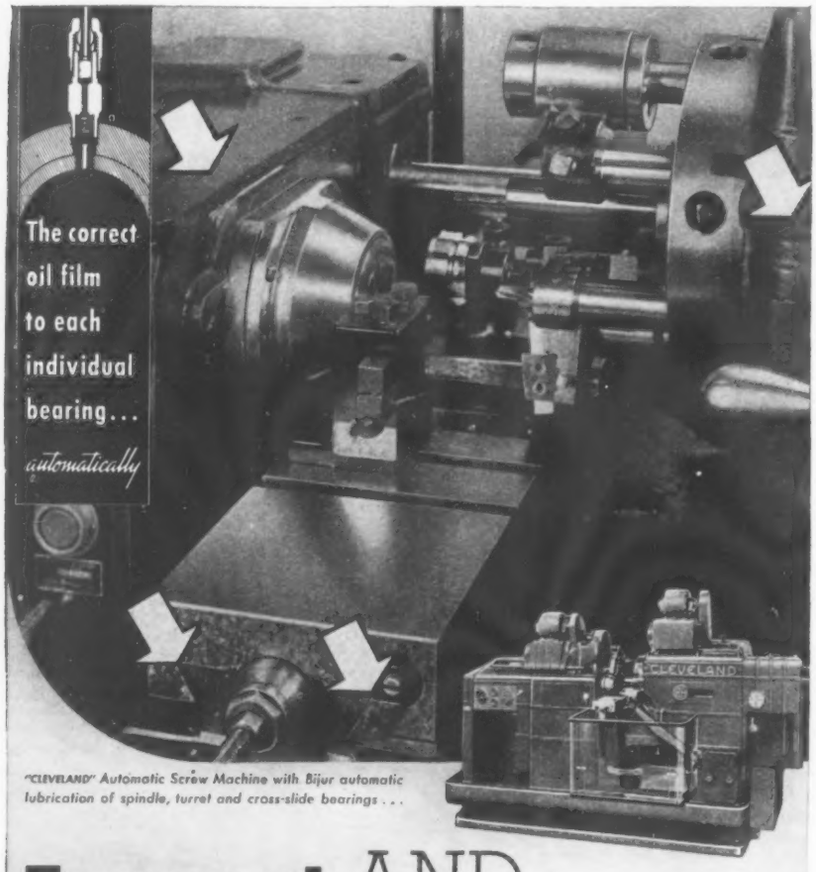
GEAR CUTTING Latest types of gear generators are described in Bulletin No. 442, issued by the Farrel-Birmingham Co., 355 Vulcan St., Buffalo, N. Y.

GEAR FINISHING The "Red Ring" process of gear finishing is discussed in an eight-page illustrated bulletin published by the National Broach & Machine Co., Shoemaker & St. Jean Sts., Detroit, Mich.

GEAR GENERATOR The No. 2C gear generator for high precision and high production is described in a 16-page illustrated bulletin, No. 442, published by the Farrel-Birmingham Co., 355 Vulcan St., Buffalo, N. Y.

GEAR LAPPING The "Red Ring" process of gear lapping is described in a four-page illustrated folder issued by the National Broach & Machine Co., Shoemaker & St. Jean Sts., Detroit, Mich.

GRINDING The Division of Simplified Practice of the National Bureau of Standards has made available copies of the fourth revision of



"CLEVELAND" Automatic Screw Machine with Bijur automatic lubrication of spindle, turret and cross-slide bearings . . .

For speed AND **ruggedness**

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AUTOMATICALLY *Correct* LUBRICATION

Simplified Practice Recommendation R45, Grinding Wheels, identified as R45-39. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 10 cents each.

HOUGHTON PRODUCTS "Houghton Products for the Metal-Working Industries" is the title of a 20-page booklet offered by E. F. Houghton & Co., 240 W. Somerset St., Philadelphia, Pa. The properties of cutting oils and bases, grinding oils, carburizers, quenching oils, salt baths, hardening salts, metal cleaners, drawing compounds, rust preventatives, lubricants and other products are discussed.

IRON CEMENT Applications of "Smooth-On" cement are described in a 40-page illustrated folder offered by Smooth-On Mfg. Co., 568–574 Communipaw Ave., Jersey City, N. J.

LUBRICATION A 24x36-in. wall chart illustrating many types of lubricating devices has been made available by Gits Bros. Mfg. Co., 1854 S. Kilbourn Ave., Chicago, Ill.

LUBRICATION Characteristics of kerosene lubrication as applied to grinding wheel spindle bearings is discussed in a four-page illustrated folder offered by the Norton Co., Worcester, Mass.

MAGNET WIRE Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y., has published a revised edition of its magnet wire catalog. Containing 92 pages, it provides complete engineering data and extensive recommendations covering magnet wire for every type of service. Much of the same data, in condensed form, is also available in a 40-page handbook.

MAINTENANCE Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has issued three more booklets containing hints on electrical maintenance. No. F-8392-7A provides convenient tables and formulas, No. F-8392-8 covers commutator maintenance, while No. F-8392-9 discusses bearings and lubrication.

MEEHANITE "Meehanite—The Metal for Machine Tool Castings," a 16-page illustrated bulletin (No. 9), has been published by the Meehanite Research Institute of America, Inc., 311 Ross St., Pittsburgh, Pa.

MILLING An extensive line of "Multi-Millers" is described in Bulletin No. 36, published by U. S. Tool Co., Ampere, N. J.

MOTOR CONTROL "Features of the 'V-S' " all-electric adjustable speed drive for a.c.-circuits are discussed in Bulletin No. 307, issued by the Reliance Electric & Engineering Co., Ivanhoe Rd., Cleveland, Ohio.

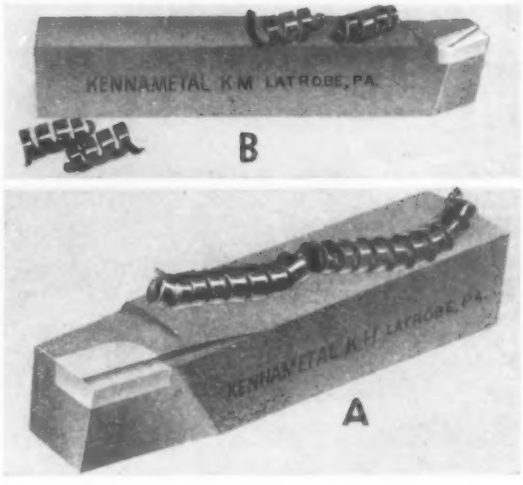
MOTOR GENERATORS Design features and specifications of a line of motor generator sets are included in Form No. 935A, issued by the Century Electric Co., 1806 Pine St., St. Louis, Mo.

MOTOR PUMPS Form No. 1917, available from Ingersoll-Rand Co., 11 Broadway, New York, N. Y., shows construction details of general service motor pumps, built in capacities of 5–1,000 gal. per min.

MOTORS List prices of an extensive line of a.c. and d.c. motors are provided in Bulletin No. B-6010, released by the Allis-Chalmers Mfg. Co., Milwaukee, Wis.

MOTORS Repulsion-start single-phase induction motors, of $\frac{1}{8}$–40 hp., are described in an 8-page illustrated bulletin issued by Century Electric Co., 1806 Pine St., St. Louis, Mo.

COMPLETE CONTROL of Continuous Steel Chips

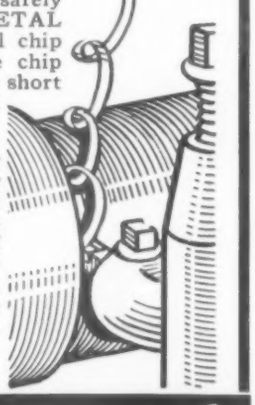


with

KENNAMETAL Chip Breaker Tools

NOW you can dispose of long, unbroken steel chips safely . . . quickly . . . economically . . . with KENNAMETAL chip breaker tools. Fig. A shows a typical parallel chip breaker form for coiling chips; Fig. B shows the chip breaker ground at an angle for breaking chips into short pieces. Both chip breaker forms are available on all standard KENNAMETAL tools.

Because of its superior strength, chip breakers may be ground on KENNAMETAL without seriously weakening the tip . . . and tools may be designed more efficiently for many types of work. At the same time, KENNAMETAL retains all the advantages of other hard carbide tool materials—such as higher cutting speeds and more pieces per grind of tool. You can increase the production of your plant *economically* and *safely* with KENNAMETAL. Write for complete information today.



McKENNA METALS Co.
103 LLOYD AVENUE
LATROBE, PENNSYLVANIA, U.S.A.

MOTORS Form No. 1066, issued by Century Electric Co., 1806 Pine St., St. Louis, Mo., discusses automatic-start polyphase induction motors.

MOTOR STARTER Bulletin No. GEA-2964A, issued by the General Electric Co., Schnectady, N. Y., illustrates features of the new Type D-51 starter for small-horsepower motors.

RELAYS General Electric Co., Schenectady, N. Y., provides specifications of the Type IJD single-pole and triple-pole percentage differential relays for protection of a.c. rotating machines in Bulletin No. GEA-3235.

SCREWS A 4-page illustrated folder devoted to Pheoll-Phillips recessed-head screws and bolts has been issued by the Pheoll Mfg. Co., 5700 Roosevelt Road, Chicago, Ill.

SHEET METAL Complete specifications, including prices, of an extensive line of sheet metal-working machinery are included in a 64-page illustrated catalog, No. 39, published by the Ward Machinery Co., 564 W. Washington Blvd., Chicago, Ill.

SURFACE GRINDERS Bulletin No. H-V-1, issued by Hill Clutch Machine & Foundry Co., 6400 Breakwater Ave., Cleveland, Ohio, describes horizontal-spindle and vertical-spindle heavy-duty hydraulic precision surface grinders.

SWITCHGEAR Bulletin No. B-6011, issued by the Allis-Chalmers Mfg. Co., Milwaukee, Wis., provides 12 pages of information concerning indoor cubical type switchgear. Bulletin No. B-6012 contains 12 pages discussing metal-clad vertical lift switchgear.

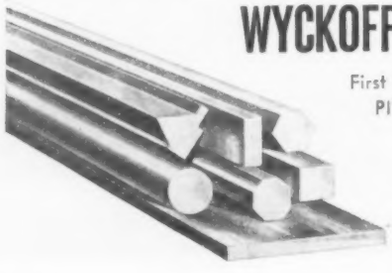
TOOL GRINDING A wall chart giving instructions for the correct grinding of "Kennametal" carbide tools is now being distributed by the McKenna Metals Co., 103 Lloyd Ave., Latrobe, Pa.

TOOLS The Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio, has announced publication of a 253-page catalog, No. 44, listing standard and special-purpose twist drills, counterbores, spot facers, countersinks, reamers, end and hollow mills, and such miscellaneous tools as lathe centers, mandrels, screw extractors and sockets. Considerable data of value to the users of these tools is included in this catalog.

VOLTMETER Bulletin No. 538, issued by the Bristol Co., Waterbury, Conn., describes features of a new portable voltmeter.

—TO INSURE MAXIMUM ENDURANCE AND WEARABILITY OF YOUR STEEL PARTS IN EVERY DAY SERVICE

Backed by complete plant and metallurgical facilities, Wyckoff offers you a "tailor-made" cold drawn steel service that fits your particular parts production like a glove. No matter what quality or combination of properties you require in cold drawn steel, Wyckoff can serve you superlatively well through well stocked warehouses and conveniently located distributors in every important industrial center.



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3200 So. Kedzie Avenue CHICAGO, ILL.

Mills at Ambridge, Pa. and Chicago, Ill. . . . Warehouse Stocks in Principal Cities . . . Manufacturers of Carbon and Alloy Steels . . . Leaded Steels . . . Turned and Polished Shafting . . . Turned and Ground Shafting . . . Wide Flats up to 12" x 2"

An Emergency Casting

BY H. M. LANE

One day about 1:00 p.m. in 1893, the mines superintendent rushed into the engineering office saying, "The pump in the hard coal slope is down. The back head is smashed, and it will not take two days to drown out the lower level, even in this desert country."

It was dry season, and the thermometer on the north porch of the office was then reading over 120 F., even if it was in the shade.

A few minutes later two Mexicans deposited the smashed casting on the office floor. It was from a duplex pump made at Holyoke, Massachusetts, many years before. One of the nuts securing the piston head to the rod had worked loose and knocked out the center of the head and split the head into several pieces. The cylinders were about 12 in. in diameter, and the head was shaped like

the figure 8, covering both cylinders. In the center of each head was an extension about 4 in. in diameter and 1¼ in. deep for the nut on the piston rod to run into. Fortunately, the cylinder was not broken.

The engineer laid the pieces on the floor, and examined them. He remembered that, in his large force of men that was installing machinery and constructing buildings in the new camps, he had several men from Pittsburgh who had been molders. A message was sent to get some of these, and about a dozen other men that he thought would come in handy.

About the time the gang were assembled, the superintendent came boiling in, saying, "We had Holyoke on the telegraph wire, and find that that model of pump is obsolete. They will have to make a pattern, and cannot ship the casting for six days. By that time the mine will be flooded."

The engineer said, "Keep your shirt on. By tomorrow night I will have a new head on that pump."

The superintendent left, and things commenced to happen.

One man was sent for about twenty pounds of coal from one of the soft coal mines; another for a large cast iron mortar from the storeroom; one to get a wagon load of plaster, sent from where the new buildings were being constructed.

Clay was dug from the bank back of the office.

Two 10 x 10 in. timbers about 24 ft. long were dragged down to the flat ground back of the office.

In the center of these timbers was placed a flat stone about 4 ft. across, so that the top of the stone was about 1½ ft. above the ground.

The storeroom furnished two new blacksmith's bellows.

Men got busy and enlarged the inlet and outlet holes in the bellows, cut off the tuyeres or nozzles, so that they would handle more air.

One of the bellows was mounted on a platform at each end of the timbers, and a frame constructed about it with a long lever so that it could be worked or pumped by four men. This made it possible to get all the air possible through the bellows.

A tinsmith made tin pipe running from the bellows to near the flat stone on each side.

A long sheet of black iron was bent to form a section of the stack about 28 in. inside diameter, and it was riveted down the side. The stack was a little less than 5 ft. high.

A hole was cut in each side, about 8 in. from the bottom, and connections made to introduce a tuyere pipe a little less than 3 in. in diameter. Connection was made from the tuyere pipe to the tin pipes from the bellows by means of a short canvas pipe just as the tuyeres in the old-fashioned lead blast furnaces were connected.

The shell had a hole in the front for a tap hole, and a spout was constructed that extended over the edge of the stone.

A sand bottom between 3 and 4 in. thick was put in, and the sides of the shell lined with a layer of sand and clay rammed in and dried with a charcoal fire.

Shortly before this story commenced, it had been necessary to clear the site for the future town, and during this time a large number of cedar trees were cut down. All of the wood of any size was saved, and a pile of pieces from ½ to 4 or 5 in. in diameter was made, the pile being about 10 ft. wide, 50 ft. long, and 6 or 8 ft. high. The pile was covered with clay and then burned as an old-fashioned charcoal kiln. This resulted in a large pile of very good charcoal, which came in exceedingly handy when the present job turned up.

At the back of the metal shell, a

MORE PRECISION WORK
With Rivett Spring Tempered COLLETS
A set of spring tempered collets and draw-in attachment can improve the production and precision work on any engine lathe. This quick, accurate method of chucking bar stock and odd shaped parts is a guarantee for MORE PRECISION WORK.
The collet attachment and any style collets can be furnished from stock. Write for bulletin 100-b and print to be filled in with the required spindle dimensions.
RIVETT LATHE & GRINDER INC.
Brighton, Boston, Mass.
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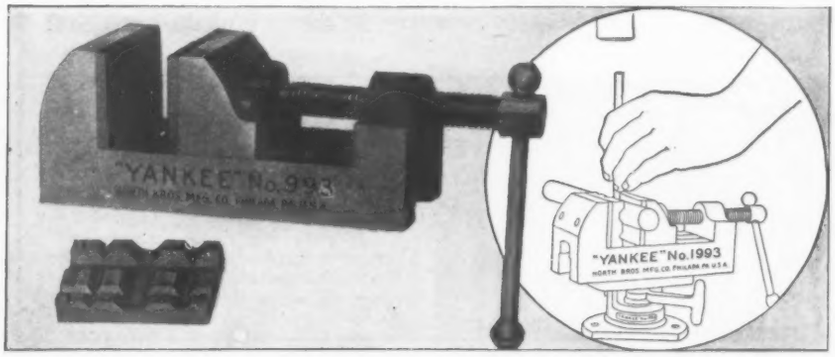
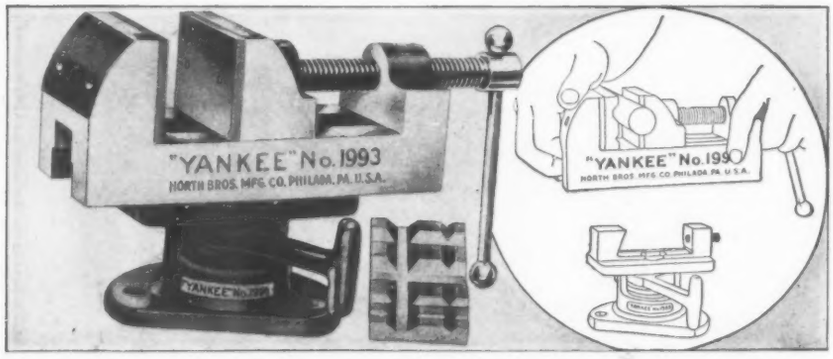
SPEED with accuracy

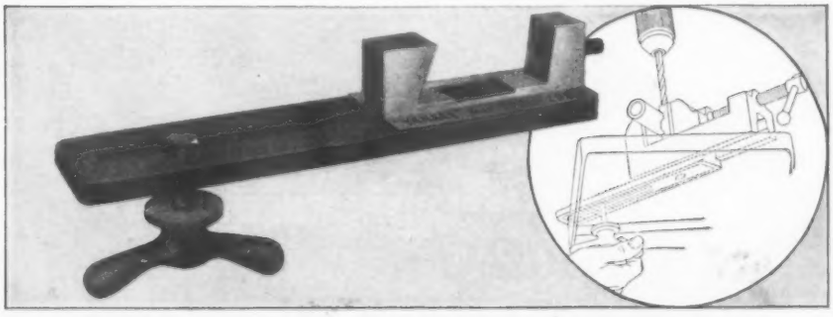
"Yankee" Vises added to your shop equipment, will save time, save labor—at both start and finish of a job. These vises assure ease and accuracy of handling!



■ Accurately Machined—sides, ends and base, the "Yankee" Vise holds work square on face plate or machine bed. Hardened steel block with V grooves holds rounds. Made in four sizes without swivel base: No. 991, 1½" jaw width. No. 992, 2" jaw width. No. 993, 2¾" jaw width. No. 994, 4" jaw width.



■ Removable With Work, from swivel base, "Yankee" Vise carries the work in original alignment from bench to drill press and other machines. Locks on base at any position. Made in four sizes with swivel base: No. 1991, 1½" jaw width. No. 1992, 2" jaw width. No. 1993, 2¾" jaw width. No. 1994, 4" jaw width.



■ "Yankee" Clamp attaches "Yankee" Vise to face plate, holding work rigid for machining operations. Two sizes: No. 2992 for Vises No. 992 or No. 1992. No. 2993 for Vises No. 993 or No. 1993.

ORDER from your Supply House. For "Yankee" Tool Book, showing many ingenious tools, write North Bros. Mfg. Co., Dept. AM, Philadelphia, U. S. A.

wooden platform was constructed about even with the top of the shell.

It was estimated that about 250 lb. of molten iron would be all that would be required for the casting and the gates, so this amount of scrap was selected and broken into small pieces.

A ladle was made from sheet iron which was bent up into suitable form and had a bottom riveted in. This ladle was lined with a mixture of clay and sand and dried with charcoal. For a ladle shank, two hardwood poles were fitted with a yoke of small rods and wire, and the ladle hung between them. A hole was dug on the tapping side of the cupola to receive the ladle.

In the meantime, holes had been drilled and tapped in the pieces of the broken cylinder head, so that the casting could be used as a pattern, and the pieces removed from the sand one by one by screwing a bolt into these holes.

A wooden flask was made and a mold rammed up from a mixture of sand and clay, into which some of the powdered coal was introduced to serve as sea coal.

The face was finally finished with some charcoal powder. The mold was thoroughly skin-dried by pans with charcoal fires in them.

The whole performance started at 1:00 p.m. The engineer stayed on the job from the start to the finish, but the men worked in shifts.

About 2:00 p.m. of the second day eight men were pumping the bellows for all they were worth, blowing the charcoal fire in the furnace. In a short time the ladle was tapped full, was picked up, carried over, and the mold poured.

The pipes were then disconnected from the shell and the shell knocked on its side and cleaned out.

As soon as the casting was black, it was taken to the blacksmith's shop and holes drilled for the studs. These holes were drilled with a flat drill made $\frac{1}{16}$ in. larger, so as to be sure that the head would fit on the studs.

By the time the casting was taken to the mine and down the 3,000 ft. inclined slope, it was cool.

In the meantime, the water had risen to a point slight above the top of the pump, so that all the nuts had to be put on under water.

The casting came out straight, but to make sure of a tight fit, a double rubber gasket was used.

It was a little before 5:00 p.m. when the pump was running, and the offending water on its way out.

The engineer had only missed one night's sleep, but he had had a splendid time.